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The Nutritive Values of Indian Cattle Foods and the Feeding of Animals
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THE NUTRITIVE VALUES OF INDIAN CATTLE FOODS AND THE FEEDING OF ANIMALS

By
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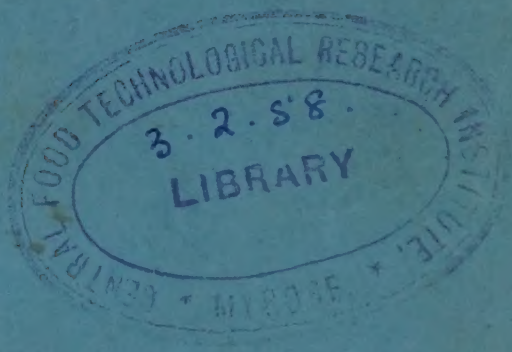

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INTRODUCTION

THIS bulletin was first published in 1938 and a revised edition was brought out in 1946. The present issue is the third edition in which some important changes have been introduced, both in the text and in the tabular statements.

The original idea in preparing a publication of this nature was to bring together all the information regarding the feeding values of Indian cattle foods for the use of practical farmers in this country. A large amount of data was available in the literature published by various research workers, but these had to be collected and put in a suitable form which could be utilised by our livestock owners.

In the present edition, the arrangement of the bulletin remains the same as in the previous one. An explanatory note describing the general principles of animal nutrition as applied to the practical rationing of livestock is given. This is followed by a statement of requirements for specific purposes, the standards given being those adopted mainly by American workers, as no data of a similar nature are available here. The method of computing rations is illustrated by some examples. A few selected concentrate mixtures are listed with their feeding values. The question of mineral and vitamin A supplements is also discussed. Three appendices are given, namely (1) Composition of Indian Feeding Stuffs, (2) Digestibility Coefficients of Indian Feeding Stuffs and (3). Digestible Nutrients per 100 lb. of Indian Feeding Stuffs together with their Total Digestible Nutrients, Nutritive Ratios and Starch Equivalents. The last one is sub-divided into two parts, one containing the values expressed on a dry matter basis, which will appeal to scientific workers and the second contatining data from which it is easy to find out the approximate feeding values per 100 lb. of raw materials. This part will be of more use to practical workers and can be utilised as a ready reckoner.

Some of the important modifications introduced in the present edition are, the revision of the Table III dealing with the requirements of working animals, revision of the Table IV dealing with the requirements for growth depeding on the mature live weights of animals and omission of the table dealing with beef cattle which is not very important for practical purposes. Some of the calculations for typical rations have been given on a modified basis which has been explained in the text. A new sub-head 'Cultivated fodders and grazing' has replaced the previous one entitled 'Feeding of green grass and silage'. Some new data have also been incorporated in the various tables.

The compilation of the data given in the first edition was done by my colleagues of the Animal Nutrition Section, Indian Veterinary Research Institute, Izatnagar, Messrs, N.C. Dasgupta, N.K Ayyar. T.S. Krishnan and P.A. Seshan. Since then, other data have been added to bring the work up-to-date. The author is greatly indebted to Dr S.C. Ray, Dairy Technologist of this Institute for his help in revising the bulletin for this edition. He would also like to thank the various workers in different parts of the country who have expressed their appreciation of the usefulness of this bulletin.

August, 1951 K. C. SEN

Indian Dairy Research Institute,
Bangalore

Preface to the Fourth Edition

In preparing this fourth edition of the bulletin, the paragraphs on 'Mineral matter' and 'Mineral supplement' presented in chapters dealing on general principles and the feeding standards have been rewritten and some new data have been incorporated in the Tables I, II and III of the Appendices.

July, 1955 K.C. SEN

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Karnal

GENERAL PRINCIPLES

FOOD is essential for the maintenance of life. The nutrients in a feeding stuff enable the animal body to produce the necessary heat to maintain the body temperature, the energy to perform the vital processes of life and the material to replace the essential tissue breakdown which occurs continuously. The food also provides the constituents and the energy required for the production of the body growth in young animals and milk and work by adult ones.

All feeding stuffs are composed of water, organic and mineral mater. Organic matter is again composed of proteins, fats, crude fibre and soluble carbohydrates. The part played by these constituents of food in the nutrition of animals may be considered under the various ingredients which a chemical analysis of the food reveals.

Water. Feeding stuffs always contain a certain amount of water. Even an apparently dry fodder, such as straw, contains about 1/10th of its weight as water and the rest as dry matter. All the processes of digestion, absorption of nutrients and elimination of waste from the body require an abundant supply of water either directly or in the shape of succulent feeding stuffs. Water plays an important part in the regulation of the temperature of the body. The water in a feeding stuff is also the carrier of some valuable amides and vitamins in solution.

Proteins. The crude protein in a feeding stuff includes the true protein, containing a number of amino acids, and non-protein nitrogenous compounds such as the amides. The proteins are mainly used for the production of lean meat and for replacing the physiological losses of protein from the body. The raw proteins required to supply the proteins in milk have also to be provided by the diet of the animal. Any excess of proteins in the food may be used by the animal for the formation of fat and production of energy.

Fats (Ether extract). The fats in feeding stuffs are useful only as energy producing sources. They cannot serve the function of proteins either for building up the muscle or to repair the daily nitrogenous waste. Fat is an energy concentrate, each gram of fat being equal in fuel value to about 2·25 grams of carbohydrates or proteins. The excess energy supplied to the animal over its requirements is generally stored by the system as fat to be drawn upon in times of need. Some of the important vitamins and fatty acids essential for the health of an animal are also supplied through the fats in the diet.

Crude fibre. The cell walls and woody fibre of all plants go under the category of fibre. Naturally this constituent is the least digestible part of the feed. The work and expenditure of energy in chewing and digesting such material make its nutritive value still less. But the digested fraction is used by the animal body exactly like the soluble carbohydrates.

Soluble carbohydrates (nitrogen-free extract). Starch and sugar form the main ingredients of this class of substances. These are used by the animal to produce heat, energy and fat in the body. They are also the source of the fat and sugar in milk. Excess of carbohydrates is reserved by the body in the form of depot fats.

Mineral matter. The minerals available in the feed of an animal are used for the making and repair of bones, digestive juices, blood, etc. and also form the source of the large amounts of minerals secreted through the milk. Not only as a whole but also in individual ingredients minerals are found to be important factors in the adequate nutrition of animals. Farm animals, especially those in active stage of growth, those in advanced state of pregnancy and those which producing liberal quantities of milk are prone to suffer from a lack of calcium and phosphorus. The feeding stuffs vary markedly in their calcium and phosphorus contents. Besides, the availability of calcium and phosphorus from feeding stuffs is not necessarily indicated by their gross composition in a feed The absorbability of these minerals in the animal system is dependent upon several factors, such as the chemical combination in which they occur, the physical association with other constituents of feeds. (specially with crude fibre), the proportion of calcum and phosphorus in the ration any excess of one or the other beyond 1 to 2 parts of calcium to each part of phosphorus being detrimental to their optimum utilization the absence of vitamin D in certain cases, the presence of deleterious subs–

tances like oxalates, fluorine, etc. Apart from sodium and chlorine (common salt), calcium and phosphorus, such elements as iron, copper, manganese, iodine and cobalt, although required in small quantities or even in traces by farm animals when found insufficient or absent in feeding stuffs are known to cause considerable set back in the maximum animal production. A lack of iron or of both iron and copper has been found to occur in forages of certain localities of the world causing in cattle stunted growth, emaciation and weakness with low haemoglobin content in the blood. The over-all bodily function or metabolism of living animal is regulated by the secretion of a hormone by the thyroid gland. This hormone is an iodine containing compound (thyroxine) and its normal secretion is dependent on the optimum supply of iodine in the food. When the dietary supply of iodine becomes insufficient, the thyroid gland enlarges in an attempt to produce the requisite quantity of thyroxine resulting in endemic goiter. In certain areas of the world, the soil and, therefore, water and food crops are known to be deficient in iodine. The incident of goiter in farm animals in these regions has been successfully checked by the addition of small quantity of iodine in the feed. The presence of traces of cobalt in the ration has recently been found essential for the growth and health of farm animals. The lack of cobalt in the soil and thus to herbage has been established in certain parts of Australia, New Zealand. America and Canada. where cattle have been found to be affected. The symptoms are, loss of appetite and weight, general weakness, anaemia and at the terminal stage, death.

Vitamins. Besides the above, there are certain substances known as vitamins, which are considered to be essential for the proper nutrition of farmstock. Of these, the more important ones from the point of view of cattle nutrition are vitamins A and D, because these have to be supplied to the animals through their feed, but vitamins B and C can be synthesized in the ruminant body. If sufficient green pasture is fed to animals, the need for vitamins A, B, C, D and E is satisfied.

Although the chemical composition of a foodstuff is not a criterion of its feeding value, it forms the basis for judging its nutritive value. Appendix I gives the analysis of a number of foodstuffs for their various ingredients. The absence of representative data for the vitamin contents of the various feeding stuffs is responsible for the deletion of that item from the tables of analysis.

The value of a food stuff depends upon the proportion of it which is digested. The ratio of the digestible portion to the total amount fed multiplied by 100 represents the coefficient of digestibility of a nutrient in the particular feed or in the feed mixture used in a feeding experiment. Digestibility determinations have been carried out for several of the feeding stuffs available in India and the coefficients of digestibility of the various constituents are recorded in Appendix II. For the convenience of users, the coefficients have been rounded to the nearest integer.

From the data given in Appendices I and II, the digestible nutrients per 100 lb. of feeding stuff have been claculated and are tabulated in Appendix III. This table gives in addition, the total digestible nutrients, nutritive ratios and starch equivalent values of all the common feeding stuffs experimented within India. These together with the digestible crude protein contents are the figures which enable to find out whether a diet provides in a sufficiency of the major ingredients involved in nutrition. It would be appropriate, at this stage, to explain what these figures connote.

Digestible crude protein. In the past, opinions differed as to whether the non-protein nitrogenous compounds in a feeding stuff have a nutritive value equal to that of the true protein or only half as much. The researches carried out in recent years, however, show that the non-protein nitrogenous compounds play, in ruminant system, almost an identical role as the true protein. Hence Digestible Crude Protein (D.C.P.) fraction represents for all practical purposes, the available protein in a feed mixture.

Although protein can replace the carbohydrates in the dietary for purpose of heat production, this is never done in practice because nitrogenous material is always found to be costlier than carbohydrate material.

Starch equivalent. In the United Kingdom and some other European countries, the available energy in a feeding stuff is calculated in terms of Starch Equivalent. The basis of calculation is as follows.

(*a*) In energy value 1 lb. of carbohydrate in the feed is equivalent to 1.00 lb. of starch, 1 lb. of protein equivalent to 0.94 lb. of starch and 1 lb. of fat (or ether extract) is equivalent to 1.91 lb. or 2.12 lb. or 2.41 lb. of starch, according as the source of the fat is coarse fodder or cereal grains and byproducts or seeds and oil cakes respectively.

(*b*) Each kind of nutrient is multiplied by the above conversion factors and the figures are added.

(*c*) In the case of concentrates the sum total of the added value obtained in (*b*) is multiplied by the respective 'Value Number given by Kellner (*vide, The Scientific feeding of Animals* by Kellner, translated by Goodwin, Duckworth & Co.) to obtain their Starch Equivalent or S.E. Value.

(d) In the consumption of fibrous coarse food a considerable amount of energy is spent in chewing, ruminating and other associated work of digestion. For the roughages, therefore, a correction is made for the fibre content by deducting the following from the added figure in (b) to obtain the S.E, Value :

If the feeding stuff contains 4 per cent and less crude fibre, 0.29 for every per cent of actual crude fibre.

If the material contains 5 per cent and less crude fibre, 0.31 for every per cent of actual crude fibre.

If the material contains 6 per cent and less crude fibre. 0.34 for every per cent of actual crude fibre.

If the material contains 7 per cent and less crude fibre, 0.36 for every per cent of actual crude fibre.

If the material contains 8 per cent and less crude fibre, 0.38 for every per cent of actual crude fibre.

If the material contains 9 per cent and less crude fibre, 0.40 for every per cent of actual crude fibre.

If the material contains 10 per cent and less crude fibre, 0.43 for every per cent of actual crude fibre.

If the material contains 11 per cent and less crude fibre, 0.45 for every per cent of actual crude fibre.

If the material contains 12 per cent and less crude fibre, 0·48 for every per cent of actual crude fibre.

If the material cantains 13 per cent and less crude fibre, 0.50 for every per cent of actual crude fibre.

If the material contains 14 per cent and less crude fibre, 0.53 for every per cent of actual crude fibre.

If the material contains 15 per cent and less crude fibre, 0.55 for every per cent of actual crude fibre.

If the material contains 16 per cent or more crude fibre, 0.58 for every per cent of actual crude fibre.

Total digestible nutrients. In the U.S.A., the energy value of a feed is calculated in terms of Total Digestible Nutrients (T.D.N.) The theoretical basis in the calculation of T.D.N. is that in the ruminant system for all practical purposes, the energy efficiency of a unit of digestible carbohydrate is the same as that of a unit of digestible protein, whereas the energy efficiency of a unit of digestible fat is equivalent to 2.25 units of either digestible carbohydrate or digestible protein. Thus in order to obtain the T.D.N. value of a feed, the digestible ether extract is multiplied by 2.25 which is then added to the sum of digestible crude protein and digestible total carbohydrates.

Nutritive ratio. This is the ratio of digestible protein to the digestible non-nitrogenous nutrients in a feed. The amount of non-nitrogenous nutrients is reckoned as the sum of digestible total carbohydrates and digestible ether extract multiplied by 2.25. The value of nutritive ratio gives the idea of the proportion of digestible protein in relation to other nutrients. The ratio is narrow in the case of protein-rich feeding stuffs and wide where the feeds are rich in carbohydrate or in fat or in both.

Principles of Rationing

The ration of an animal may be divided for convenience into two parts, one for maintenance and the other for production purposes. The maintenance ration is that portion of the diet which just enables the animal at rest to carry on the essential processes of life, such as breathing and circulation of blood, without either gain or loss of weight. This to a certain extent is dependent upon the live weight of the animal although not strictly proportional to it. The maintenance requirement actually varies with basal metabolism and the latter, in

turn, with body surface. In order to express it as proportional to body surface, instead of taking live weight as such, one has to consider two-thirds power of live-weight, or $\sqrt[3]{W^2}$, where W stands for live weight. As however, no animal is kept in a farm in a state of non-production, the requirements for maintenance form only a convenient basis for the calculation of rations for productive purposes. Whatever is supplied to the animal over and above its maintenance requirement is available for production. such as for growth or fattening, for production of calf, for production of milk or for output of work.

Growth. This is the most important form of live stock production, because it is the foundation on which the other forms of production such as beef, milk or work rest. Within the limits set up by hereditary factors, it is the adequate growth of the young one that determines the possibilities of the animal as a producer. If the growth of a young animal is retarded, it will result in a permanent and substantial loss of production by the animal and its progeny.

The requirements for growth and those for maintenance of the adult animal are very different. For a calf of the same body weight as a mature bullok at rest, the total nutrient requirements are far more than that of the bullock. Since growth consists largely of an increase in the sizes of the muscles, protein tissues and skeleton, large amounts of proteins, minerals and vitamins must be provided.

Reproduction. For a mother in calf, adequate provision must be made for the growth of the foetus as well as to keep the dam fit to give a liberal supply of good milk on calving. This extra provision need, however, be made only during the last third of the period of pregnancy. If the mother is under-nourished or is on an unbalanced ration, the calf born is weak and under-sized and the milk yield of the cow low and poor in vitamin content. Lack of an adequate supply of vitamin A often results in abortion or brith of weak or blind calves.

Fattening. Growth and fattening are two complementary aspects of meat production. The term fattening implies the deposition of large quantities of tissue fat but this is not the sole object in economic meat production. The aim in meat production is to acquire the maximum amount of lean meat, the quality of which is simultaneously improved by the storage of fat in the muscles and protein tissues, so that the maximum growth synchronises with the optimum fattening when the animals reach maturity. The requirement of animals for growth is so exacting that unless an abundant supply of net energy is provided in the feed, in excess of the requirement for normal growth, no fattening but only growth will take place.

The rate of conversion of food nutrients into body fat is higher in the case of young ones than with mature animals. Hence if fattening is retarded in the earlier stages, it will make the cost of meat production very high in the later stages. Although fattening as such requires very little protein, it is necessary to increase protein supply also in order to effect rapid gains. Further, the total digestibility of a ration is greatly reduced if the proportion of a ration in it is very small. Minerals and vitamins should also be adequately provided, particularly to growing animals, to avoid any unthriftiness in the fattened animals.

Milk production. Milk is the most widely used product of livestock. The composition of milk differs from that of the carcass or the blood. It is specially rich in protein, lime and phosphorus, and contains large quantities of lactose, fat and vitamins. It is obvious that the animal must be provided with a sufficient quantity of all these ingredients, in addition to its maintenance requirements, in order to be able to cope with the continuous drain from its body in the form of milk.

The cow converts the food proteins into milk protein very efficiently. About 1.25 times the quantity secreted in the milk will satisfy its requirements for milk production, exclusive of the maintenance allowance. Although animals have the capacity to convert the carbohydrates in the feed for the purpose of milk fat production, it is easier for them to convert the fat in their feed. So it is advisable that the concentrate ration of cows should contain at least 4 per cent fat. Minerals and vitamins in the feed of lactating animals are very important.

Work production. Increased muscular effort naturally results in a large amount of nutrients being oxidized in the system. It is known that all the organic constituents of

a food are capable of being utilized as sources of energy. However, when the supply of food is adequate, a working animal first draws upon the carbohydrates and fats of the feed. If the supply is insufficient, the body fat is used for the purpose and in the last resort the muscles and other protein tissues are attacked. But so long as there is an abundant supply of carbohydrates in the feed, a mature animal at work needs very little more protein than while at rest. In this respect, work production differs radically from growth or milk production.

The nutrient requirements of working animals depend upon the amount of labour performed. The heavier the work, the greater should be the proportion of easily digestible carbohydrates in the ration. About one-fourth to one-third of the net energy supplied for production purposes is converted into actual useful work. Calculating on the basis of the total gross energy intake per day, an animal working for a full day yields 9 per cent of the intake as actual work. Many factors are known to influence the efficiency of utilisation of the feed by a working animal, such as the breed, the speed of working, fatigue and practice.

Practical scales of feeding. Extensive studies have been made in other countries on the requirements of various classes of live stock by means of feeding experiments. Limited investigations carried out in this country suggest that the adoption of foreign standards always leaves a fair margin of safety so far as the feeding of Indian cattle is concerned. There is, therefore, a scope for reduction in these standards for Indian cattle. The figures for maintenance, growth and milk production, given later on, are based on the averages of the maximum and the minimum recommended by Morrison. The figures given for the Net Energy have been converted into corresponding Starch Equivalent Values. The standards recommended for growing and working animals are partial modifications of those suggested in the earlier edition of the Bulletin. The modifications are as follows :

(a) Tentative supplementary standards for growth have been given to accommodate Indian animals whose mature weights are three-quarters or half of those of foreign breeds. The standard for calves reaching the mature weight of 1,000 lb. has been based on Morrison's data as given in the earlier issue of this Bulletin. For categories of calves reaching the mature weights of 750 and 500 lb., it has been assumed that their growth rates are 75 per cent and 50 per cent respectively of those growing to a mature weight of 1 000 lb., and the requirements of these groups have been calculated in the same proportions as the assumed rates of growth.

(b) The requirement for work production has been combined with that of maintenance in order to make the recommendation easy to apply in actual practice to Indian bullocks of varying live-weights. Besides, instead of giving three specifications for work as 'light' 'medium' and 'heavy', as was done in the earlier editions, work has been considered only as 'normal' and 'heavy', in this publication. The former is conceived to consist of 6 hours of carting or 4 hours of ploughing and the latter 8 hours of carting or 6 hours of ploughing. The data for this purpose have been computed by adding together the maintenance requirements for varying live weights as recommended by Morrison with the allowances for work. The work allowance for 'light' and 'medium' work as recommended by Kellner and given in the earlier issue of this Bulletin has been taken as the basis of requirement for 'normal' and 'heavy' work performed by an animal of 1,000 lb. live weight. Since work rate capacity is proportional to live weight raised to the two-thirds power (*vide Animal Nutrition* by L.A. Maynard), the work allowance for animals of live-weight below and above 1.000 lb. have been adjusted proportionately.

THE FEEDING STANDARDS

In the computation of a ration, the first consideration will be the capacity for consumption or appetite of the animal. The appetite is measured by the total amount of dry matter in the ration which an animal can consume. Usually the dry matter consumption varies with the live-weight of the animal and also with the nature of its production. Cattle will generally eat about 2.0-2.5 lb. of dry matter per 100 lb. of live-weight. The milch stock may eat a little more. The buffaloes are slightly heavier eaters than cows. The major portion, about two-thirds or more, of the total dry matter to be consumed should come from the roughage quota of the ration & the rest from

concentrates. After the quantity of dry matter consumption is known, the next important information required is the quantity of digestible crude protein (D.C.P.) and energy (S.E. or T.D.N.) which the ration must supply.

Maintenance and production requirements for adult animals. In general it can be stated that the maintenance requirement of a 1,000 lb. animal is 0.6 lb. D.C.P. and 6.0 lb. S.E. or 7.5 lb. T.D.N. The feeding standards of animals of different live weights are given in Table I.

TABLE I

Nutrients required for maintenance of adult cattle per head per day

Live weight lb.	Digestible crude protein lb.	Starch equivalent lb.	Total digestible nutrients lb.
200	0.123	1.31	1.72
300	0.203	1.92	2.55
400	0.273	2.50	3.34
500	0.338	3.05	4.09
600	0.399	3.58	4.80
700	0.458	4.09	5.47
800	0.516	4.59	6.15
900	0.570	5.08	6.80
1000	0.625	5.57	7.47
1100	0.652	6.43	8.11
1200	0.733	6.95	8.75

The dairy cows which have to produce milk will have to be given, over and above the maintenance requirement, additional allowance of the nutrients for milk production. The extra nutrient requirement for milk production varies with the fat content in the milk and is detailed in Table II. The milch animal in advanced stage of pregnancy (from the 5th month of gestation) should receive an extra allowance of 0.3 lb. D.C.P. and 1.0 lb. S.E. or 1.5 lb. T.D.N. over and above what she should get for maintenance & milk production. If, however, there is no milk production, the extra allowance should be superimposed over the maintenance requirement only.

TABLE II

Nutrients required for production per pound of milk to be added to the maintenance allowance.

Fat per cent in milk lb.	Digestible crude protein lb.	Starch equivalent lb.	Total digestible nutrients lb.
3.0	0.040	0.233	0.269
4.0	0.045	0.275	0.316
5.0	0.051	0.316	0.363
6.0	0.057	0.357	0.411
7.0	0.063	0.398	0.458
8.0	0.069	0.439	0.506
9.0	0.075	0.480	0.553
10.0	0.081	0.521	0.602
11.0	0.086	0.562	0.650

The requirement of nutrients for the performance of work varies, as has already been mentioned with the kind of work done. The standards of nutrient requirements of working animals are given in Table III which takes into account the nutritional demand for both maintenance and work production.

TABLE III

Nutrients requied for working animals per head per day

Live weight lb.	Normal work		Heavy work	
	Digestible crude protein lb.	Total digestible nutrients lb.	Digestible crude protein lb.	Total digestible nutrients lb.
300	0.35	3.3	0.44	4.2
400	0.47	4.3	0.59	5.5
500	0.59	5.3	0.74	6.8
600	0.70	6.2	0.88	8.0
700	0.81	7.1	1.02	9.3
800	0.92	8.0	1.16	10.5
900	1.02	8.9	1'29	11.7
1000	1.13	9.9	1.43	12.9
1100	1.23	10.8	1.56	14.0
1200	1.33	11.8	1.69	15.3

Nutrient requirements for growth. The requirement for growth is of higher order than mere maintenance and during the early

stage, relatively more protein is required than energy. The standards of requirements for growth of young stock belonging to different categories of mature weight are given in Table IV,

TABLE II

Nutrient required for growing cattle per head per day

Live weight	Class, mature weight: 1000 lb		Class II mature weight: 750 lb.		Class III mature weight: 500 lb.	
	Digestible crude protein lb.	Total digestible nutrients lb.	Digestible crude protein lb:	Total digestible nutrients lb.	Digestible crude protein lb.	Total digestible nutrients lb.
100	0.32	1.6	0.24	1.2	0.16	0.8
150	0.47	2.7	0.35	2.0	0.24	1.4
200	0.57	3.7	0.43	2.8	0 28	1.9
250	0.66	4.5	0.49	3.4	0.33	2.3
300	0.73	5.2	0.55	3.9	0.37	2.6
350	0.79	5.8	0.59	4.3	0.40	2.9
400	0.85	6.4	0.64	4.8	0.43	3.2
450	0.89	6.9	0.67	5.2	0.45	3.5
500	0.93	7.3	0.70	5.5	0.47	8.7
600	1.00	8.2	0.75	6.1		
700	1.07	9.1	0.80	6.8		
800	1.13	9.9	0.85	7.4		
900	1.19	10.8				
1000	1.25	11.5				

SOME TYPICAL EXAMPLES OF COMPUTING RATIONS

In the following paragraphs, the calculations of some typical rations are given in order to illustrate the method of using the various tables. In the actual computation, it is not necessary to use both S.E. and T.D.N. values. Only one of these values needs be used together with the D.M. and D.C.P. values. As mentioned before, the use of T.D.N. values is finding more favour in this country in preference to S.E. values. The proportions of different food stuffs given in the rations are not based on any experimental work.

(1) *Calculation of a ration for a cow weighing 600 lb. and at an advanced stage of gestation.*

The feeds available are rice straw guinea grass and rape cake. The maintenance requirement for this cow, shown in Table I, is 0.399 lb. D.C.P. and 3.58 lb. S.E or 4.80 lb. T.D.N. The animal is expected to consume total dry matter to the extent of 12 to 15 lb. With the help of data supplied in the last three columns of Appendix III the maintenance ration of the animal can be formulated as follows

	D.M.	D.C.P.	S.E,	T.D.N.
Riee straw 7 lb.	6.3	0.00	1.54	2.99
Guinea grass 15 lb	3.8	0.12	1.31	1.96
Rape cake 1 lb.	0.9	0.28	0.77	0.78
Total	11.0	0.40	3.62	5.73

The animal in addition requires 0.3 lb. D.C.P. and 1.0 lb. S.E. or 1.5 lb. T.D,N. for the purpose of gestation which can be satisfied by incorporating in the ration extra quantities of the following items :

	D.M.	D.S.P.	S.E.	T.D.N.
Guinea grass 5 lb.	1.3	0.04	0.44	0.66
Rape cake 1 lb.	0.9	0.28	0.77	0.78
Total	2.2	0.32	1.21	1.44

(2) *Calculation of ration for a cow weighing 800 lb. and yielding* 16 *lb. of milk with fat content* of 4.5 *per cent.*

The available food stuffs for the purpose are wheat *bhusa, jowar* silage, gram husk, barley, groundnut cake and wheat bran.

The animal's capacity of total dry matter consumption will be between 20 to 22 lb. which should be conveniently divided into two parts, one for formulating the maintenance and the other for milk production.

According to Table I, the maintenance requirements are met by about 0.5 lb. D.C.P and 4.59 lb. S.E. or 6.15 lb. T.D.N. The following maintenance quota of the ration can be formulated.

	D.M.	D.C.P.	S.E.	T.D.N.
Wheat *bhusa* 7 lb.	6.3	0 00	1.55	3.00
Jowar silage 20 lb.	6.0	0.14	2.04	3.06
Groundnut cake 1 lb.	0.9	0.42	0.67	0.72
Total	13.2	0.56	4.26	6.78

For milk production the items of the ration should be concentrates fed in the form of a suitable mixture. According to Table, II, the requirements per pound of milk of 4.5 per cent fat are 0.048 lb. D.C.P. and 0.296 lb. S.E. or 0.340 lb. T.D.N. which

can be supplied by a concentrate mixture of the following composition :

	Parts	D.C.P.	S.E.	T.D.N.
Barley	50	4.02	35.8	38.8
Groundnut cake	10	4.17	6.7	7.1
Wheat bran	20	2.12	12.4	13.5
Gram husk	20	0.00	6 0	11.0
Total	100	10.31	61.9	70.4
or 1 lb. of the mixture		0.10	0.62	0.70
The requirement for 2 lb. of milk of 4.5 per cent fat		0.10	0.60	0.68

1 lb. of the above mixture is thus sufficient to produce 2 lb. of milk of 4.5 per cent fat. Therefore, for the production of 16 lb. of milk, 8 lb. of the mixture should be fed in addition to the maintenance quota of the ration.

(3) *Calculation of the ration for a bullock weighing* 800 *lb. and doing normal work.*

The available feeding stuffs are wheat *bhusa,* guinea grass, *til* cake and maize grain.

The requirements for this animal according to the feeding standard given in Table III are, 0.92 lb. D.C.P. and 0.8 lb. T.D.N. The animal can consume 16-20 lb. of dry matter. The ration can be computed as follows :

Item	Quantity given lb.	D.M. lb.	D.C.P. lb.	T.D.N. lb.
Wheat bhusa	11	9.9	0.00	4.4
Cuinea grass	10	3.0	0.13	1.5
Crushed maize	1½	2.7	0.11	1.3
Til cake	1½		0.67	1.3
Total		15.6	0.91	8.5

(4) *Calculation of the ration for a growing heifer weighing* 250 *lb.*

The available feeding stuffs are wheat *bhusa,* green berseem. oats, mustard cake and wheat bran.

Assuming that the heifer belongs to Class II group (*vide* Table IV), its capacity for dry matter consumption is 5.0 to 6.3 lb. and its D.C.P. and T.D.N. requirements are 0.49 lb. and 3.4 lb. respectively.

The ration can be computed as follows :

Item	Quantity given lb.	D.M. lb.	D.C.P. lb.	T.D.N lb.
Wheat bhusa	3	2.7	0.00	1.2
Berseem	6	1.2	0.17	0.7
Concentrate mixture	2½	2.2	0.33	1.7
Total		6.1	0.50	3,6

The concentrate mixture is made up of :

Item	Parts	D.C.P.	T.D.N.
Oats	50	3.53	35.5
Mustard cake	30	8.19	22.1
Wheat bran	20	1.58	12.7
Total	100	13.30	70.3
Per lb. of the mixture		0.13	0.7

In the actual feeding of different classes of stocks it is usual to make the animal eat all the scheduled concentrate and as much as possible of the green fodder. The dry roughage is then given slightly in excess of what is prescribed and the animal adjusts its appetite or its requirement of total dry matter consumption.

In the case of milch stock, as has been already illustrated, the maintenance requirements are usually met by dry and succulent (green or silage) roughage *plus* a small quantity of a protein concentrate, such as an oil cake. A concentrate mixture is then fed to individual animals in proportion to their milk production. It is highly desirable that this production quota of the ration should be made up by suitably mixing several concentrate feeds in order to confer palatibility, laxativeness and above all the comlex nutritive quality necessary for milk secretion.

Some common concentrate mixtures. For the sake of convenience, some concentrate mixtures are given below. One pound of each mixture is of equal value and is sufficient for 2.5 lb. of milk production containing 4.5 per cent of fat. Mixture numbers 1, 2 and 4 can be prescribed for milk production in buffaloes, but in this case, one pound of the mixture is sufficient for the production of two pounds of milk only containing about 7.0 to 7,5 per cent.

(1) Cotton seed meal	25	Contains per lb. of mixture 0.12 lb. D.P. and 0. 77 lb. S.E.
Wheat bran	20	
Maize	55	
(2) Rape cake	25	Contains per lb. of mixture 0,14 lb. D.P. and 0,74 lb. S.E.
Cotton seed ...	35	
Wheat bran ...	10	
Barley ...	30	
(3) Rape cake ...	30	Contains per lb. of mixture 0,13 lb. D.P and 0,74 lb. S.E.
Barley ...	50	
Oats ...	20	
(4) Groundnut cake ...	15	Contains per lb. of mixture 0.14 lb. D.P. and 0.74 lb. S.E.
Gram ...	40	
Maize ...	40	
Gram husk ...	5	
(5) Gingelly cake ...	15	Contains per lb. of mixture 0,14 lb. D.P. and 0,72 lb. S.E.
Gram ...	40	
Barley ...	40	
Rice bran ...	5	
(6) Groundnut cake ...	10	Contain per lb. of mixture 0,13 lb. D.P. and 0,73 lb. S.E.
Cotton seed ...	20	
Rice bran ...	10	
Maize ...	30	
Gram ...	30	

Legume hay as substitute for concentrate. The above mixtures or a suitable variation of any of them can be used with ordinary roughages, such as *anjan* hay, *dhub* grass, green maize, etc. but where leguminous hay such as berseem or lucerne is available, it is possible to cut down a considerable part of the concentrate from the feed, specially with poor or medium producers. A suitable ration with some leguminous hay as the main source of protein can be prepared by using the tables and appendices given in this publication. It is, however, not desirable to withhold completely cake or grain from a ration as this is likely to have an adverse effect in the long run.

Mineral supplement It has been stated previously that growing animals and milch cattle need a large amount of minerals, but no addition of minerals has been made in the rations for which calculations have been given above. The usual practice in large farms is to provide blocks of rock salt which can be licked by animals. Otherwise, an approximate amount of 1 oz. common salt is given to adult animals in their feed. Besides this, both for the growing and milch animals, it is often necessary to provide some phosphate and lime-rich mineral mixture, Most of the concentrates are rich in phosphate but poor in lime and as such, unless leguminous fodder or good quality hay are available, the dairy ration is likelv to be badly balanced in regard to lime and phosphate. A cow of average weight reuqires for maintaennce 1½ oz. lime (CaO) & 4/5 oz. phosphate (P_2O_5) daily and for a production of 10 lb. of milk, another ½ or ¾ oz lime and 2/3 to 1 oz. phosphate. These are rough estimates. In Appendix I, the mineral analysis is given of the common Indian feeding stuffs, from which it is easy to calculate whether a ration contains a sifficient amount of the minerals or not. In order to maintain the health of milch cattle, particularly those yielding 20 lb: or more of milk a day, and to promote healthy growth and development of young stock of superior breed, it is advisable that the ration commonly fed to cattle in India is supplemented with properly adjusted mineral mixture. This mineral supplement may be prepared by mixing together the proportions by weight of the following ingredients.

Finely powdered sterilized bone-meal	45.00	parts
Ground chalk (Calcium carbonate)	10.00	,,
Dicalcium phosphate	12.00	,,
Common salt	30.00	,,
Yellow oxide of iron	0.50	,,
Potassium iodide	0.25	,,
Starch	0.75	,,
Sodium carbonate	0.75	,,

To every 100 lb, of the mixture, add finely powdered 0.8 oz. of cobalt chloride, 4 oz. of copper sulphate and 5 oz. of manganese sulphate.

The mineral supplement recommended above when added at the rate of 2 per cent of the concentrate mixture of the ration offers protection against possible deficiencies not only of major elements, like calcium and phosphorus but also of trace elements, such as copper, cobalt, manganese and iodine which are now known to play a very important role in the normal nutrition of cattle.

Vitamin supplement. The straw and hay as commonly available in India, are practically devoid of vitamin A potency. This is also the case with most of the concentrates. For this reason. avitaminosis-A in a mild form is widely prevalent and occasional instances of this trouble, such as intrauterine

blindness, ophthalmia in growing animals, abortion and sterility are found in many places. The only practical method of remedying this defect in the ration is to provide for green grazing, failing which a suitable supplement of green feed. 8-10 lb. daily, should be given to growing, in-calf and lactating animals.

Cultivated fodders and grazing. By-products like straw, bhusa. pulse husks, bran broken grains, oilcakes, etc. and limited quantities of cottonseed, gram, maize and barley constitute important items of feed for Indian cattle. It has been estimated that if our cattle have to maintain even the present out put of work and milk without any detriment to their health and constitution, they would require very much more of the various items of by-products, seeds and grains than what is available today. Since the supply of these depends upon the production of food and cash crops and, as the prospect of accelerating the latter to the tune of animal requirement does not appear feasible in any near future, a plan is urgently needed for a system of animal feeding which could be to a large extent independent of oilcakes, bran, and other concentrate feeds. In the typical examples of computing rations given earlier, the practice now in vogue has been followed. It may be seen from these instances that the feeding schedule has been so formulated that the requirement for production is met exclusively by concentrate feeds and for maintenance, largely by a dry roughage with a small supplementation of concentrate *plus* green fodder or silage. Based on this system of feeding, when an attempt is made to estimate the over-all quantitative requirements of various feeding stuffs one finds that almost an unbridgeable gap exists between the demand and the supply.

In countries where animal husbandry has made the greatest progress, a sound diet for cattle is built around a good quality green forage. A properly selected green fodder is well known to be the most natural food for the herbivores, not only for the balanced distribution of its nutrient constituents but also for its bulk which is necessary to fill up the capacious stomach of a ruminant. Moreover, such combination in a single item of feed has been found to reduce greatly the cost of feeding, specially for milk production. In India, owing to climatic conditions and other limitations, the possibility of developing organised pasturage will be difficult to realise, but by some reorientation of cropping programme, if about 10 per cent of the total arable acreage of the country could gradually be appropriated for organised production of fodder crops, the problem of feeding the milk producing animals can easily be solved. The following example illustrates this point of view :

A milch cow of average body weight of 500 lb. and yielding 4 lb of milk of 4.5 per cent fat a day requires according to the Morrison standard as given in Tables I & II

(a) For maintenance	0.34 lb. D.C.P. and 4.I ib. TDN
(b) For milk production	0.19 lb. D.C.P. and 1.4 lb. TDN
Total	0.53 lb. D.C.P. and 5.5 lb. TDN

There is some evidence to show that Morrison's standard is rather liberal for Indian cattle ; a cut of 20 per cent can be introduced and the total requirment can be brought down to 0.42 lb., D C.P. and 4.4 lb., T.D.N. and this can be met from the following ration schedule.

		Available D.C.P. (lb.)	Available T.D.N. (lb.)
(a) Mixed green fodder of say, Guinea grass + Lucerne in the proportion of 3 : 1	28 lb,	0.43	3.6
(b) Straw	2 lb.	0.00	0.8
Total		0.43	4.4

It is well known that the majority of our cows yield on an average much less than 3 to 4 lb. of milk a day. It that is so, it is evident that in a ration schedule as formulated above, the use of concentrate feeds can easily be done away with. Even in the case of heavy yielding dairy cows and buffaloes producing on an average 15 lb. of milk a day, a basic ration drawn on the same principle would be able to maintain the animal and at the same time support the first 4 to 6 lb. of milk production. Concentrates need, therefore, be given only for the additional amount of milk yield. The new system of feeding suggested should not only reduce the use of concentrate feeds but also the cost of milk production.

Although organised pasturage is almost non-existent in this country, a fairly large amount of grass grows in so-called waste lands and in the forest area. Much of this

grass, however, is not available to the consuming live-stock owing to the remoteness of its situation.

There is an important point about green grass to which attention may be drawn. It may be observed from Appendix III that some of the hays which are nothing but field dried grass supply hardly any digestible proteins to the animals. The same materials in the green state, however, have a fairly high nutritive value including a good amount of digestible protein, and this is the reason why during the monsoon period when grass grows abundantly, emaciated indigenous cattle pick up condition quickly on grass alone. Thus, it has been found possible to maintain non-producing animals in prime condition for a large part of the year in areas where good quality *anjan* or *dhub* grass grows. When the grass is allowed to become over-ripe, much of its nutritive value is lost, but converting the green fodder into mixed silage preserves the food value considerably. When green feed is scarce, a good silage is of great value to milch cattle.

When good grazing is available, the concentrate portion of the ration can be cut down in the case of most of the animals. In this country, good grazing is available only during the monsoon months, after which the quality of the grazing becomes gradualy poor and the farmer must judge for himself if his animals are getting much food from grazing. As a rough guide, one can describe the quality of grazing as good, medium and poor and depending on this, the concentrate requirement should be varied so as to economise the cost of feeding. Thus when the grazing is good, the amount of concentrate may be cut down to one-third, in the case of medium grazing to 1/2, and in the case of poor grazing to 3/4th of the protein requirement under stall feeding conditions. The dry roughage should be given *ad lib* after the day's grazing so as to satisfy the dry matter and energy requirements. Some caution is, however, necessary in the case of heavy milking animals, where a sudden reduction in the quantity of concentrate mixture may reduce the milk yield.

The following publications may be consulted for further information :

1, *Feeds and Feeding* by F. B. Morrison : The Morrison Publishing Company, Ithaca, New York, 21st Ed., 1948.

2, *Rations for Live stock* by T.B. Wood, Ministry of Agriculture and Fisheries, London, Bulletin No. 48, 1936.

3. *The feeding of Dairy Cows* by J. Mackintosh, Ministry of Agriculture and Fisheries, London, Bulletin No. 42, 1932.

4. *The Principle and Practice of Feeding Farm Animals* by E. T. Halnan and F. H. Garner ; Longmans Green & Co., London (1940).

5. *The Scientific Feeding of Animals* by O, Kellner, translated by William Goodwin; Duck-worth & Co. (1926).

6 *Animal Nutrition* by L. A. Maynard, Mc-Graw-Hill Book Company, Inc,. New York & London (1947).

Typed

APPENDICES

APPEN

Average percentage composition of Indian

Srl. No.	Name	Place of origin	Total ash	Ash sol. in HCl	Organic constituents. Crude protein	Carbohydrates Fibre	Carbohydrates Nitrogen-free extract
	GREEN FEEDS						
1	*Bajra* (*Pennisetum typhoideum*) just before flowering	Punjab ...	14.70	10.90	16.25	28.23	38.79
2	Ditto maximum flowering	,, ...	11.30	8.61	12.56	28.45	45.72
3	Ditto milk stage ...	,, ...	9.21	6.28	10.56	27.96	50.15
4	Ditto dough stage ...	,, ...	8.21	5.40	8.81	24.90	56.22
5	Ditto ripe stage ...	,, ...	7.68	5.09	8.88	23.96	57.74
6	Ditto milk dough stage	Lyallpur ...	...	...	6.90	31.80	48.90
7	Barley (*Hordeum vulgare*) ...	Punjab ...	11.37	9.19	11.47	31.85	43.45
8	*Ber* (*Zizyphus jujuba*)	Izat Nagar	10.72	...	8.59	30.13	48.83
9	Berseem (*Trifolium alexandrium*) ...	Bihar ...	20.25	12.99	15.45	26.06	35.88
10	Ditto maximum ...	Punjab ...	18.96	14.43	23.10	30.87	46.94
11	Ditto minimum ...	,, ...	8.49	7.07	13.99	19.47	33.24
12	Ditto average ...	,, ...	14.16	12.00	17.35	25.91	40.69
13	Cowpea (*Vigna catjang*)	Bihar ...	10.86	6.80	17.38	33.10	36.16
14	Grass—*Anjan* (*Pennisetum cenchroides* young ...	Bangalore	13.82	9.23	12.41	...	...
15	Ditto prime ...	,, ...	11.57	6.61	9.97	...	...
16	Ditto ripe ...	,, ...	10.26	4.93	7.25	...	...
17	Ditto young ...	Bihar ...	17.05	9.42	7.40	...	...
18	Ditto prime ...	,, ...	13.45	7.06	8.18	...	...
19	Ditto ripe ...	,, ...	13.71	6.00	5.54	...	...
20	Ditto maximum	Punjab ...	20.85	10.96	12.02	43.62	56.84
21	Ditto minimum	,, ...	9.14	3.63	3.00	25.30	39.00
22	Ditto average	,, ...	16.08	8.14	8.36	30.54	43.30
23	Ditto young ...	,, ...	18.10	9.00	11.42	27.20	41.41
24	Ditto prime ...	,, ...	13.31	6.45	6.24	34.43	44.55
25	Ditto ripe ...	,, ...	15.85	8.73	9.10	29.16	44.29
25a	Grass—*Arali* (*Leersia hexandra*) just flowering	Assam ...	16.70	...	5.83	28.40	47.00
26	Grass—*Barajargi* (*Dichanthium annulatum*) 1st. cut ...	Bareilly ...	11.85	...	5.19	31.37	49.66
27	Ditto 2nd cut.	,, ...	9.91	...	3.79	35.03	50.09
28	Ditto 3rd cut.	,, ...	10.13	...	2.73	33.30	52.84
29	Grass—*Bhanjura* (*Apluda mutica*) 1st cut ...	,, ...	18.53	...	10.23	32.29	36.96
30	Ditto 2nd cut...	,, ...	10.91	...	4.56	33.63	40.72
31	Ditto 3rd cut ...	,, ...	12.13	...	4.06	40.15	41.97
32	Grass—*Bur* (*Andropogon taniger*) ripe stage	Punjab ...	12.34	3.90	6.13	30.46	49.23
33	Grass—*Chhimbar* (*Eleusin flagellifera*)	,, ...	12.55	6.87	11.42	33.88	40.57
33a	Cnidia Bajra (*Phalaris minor*) young ...	New Delhi	17.50	...	10.04	21.24	38.50
33b	Chhidia *Bajra* (Phalaris minor) flowering ...	,, ...	19.66	...	13.93	9.90	31.32

DIX I

feeding stuffs on dry matter basis

Ether extract	No. of analyses	Mineral constituents: Ash sol; in HCl	CaO	P_2O_5	MgO	Na_2O	K_2O	No. of analyses	Serial No.
2.03	1	10.90	1.06	0.42	0.63	0.46	6.24	1	1
1.97	1	8.61	0,84	0.48	0.48	0.06	4.80	1	2
2.12	1	6.28	0.73	0,50	0,41	0.19	3.38	1	3
1.86	1	5.40	0,60	0.39	0,34	0,24	2.96	1	4
1.74	1	5.09	0.55	0.44	0.33	0.13	2.96	1	5
1.52	...	...	...	...	...	—	...	...	6
1.86	...	9.19	0.72	0 59	0.29	0.94	3.98	...	7
1.74	1	...	0.09	0.76	...	...	...	1	8
2.36	2	12.09	2.33	0.75	0.77	—	4.78	1	9
2.78	...	14.43	4.05	0,92	0.72	2.58	5.09	...	10
1.39	...	7.07	2.20	0.32	0.38	0.36	1.44	...	11
1.89	14	12.00	2.69	0.64	0.61	1.67	3.40	13	12
2.50	1	6.80	1.96	0.78	1.44	...	1.85	1	13
...	2	9.23	0.41	0,65	0.35	1,33	4,14	2	14
...	2	6.61	0.49	0,47	0.39	1,20	2.49	2	15
...	2	4,93	0.43	0.39	0.40	0.89	1.67	2	16
...	4	9.42	0.75	0.64	0,38	1,14	4,32	4	17
...	4	7.06	0.72	0 50	0.38	0.95	3.13	4	18
...	3	6.00	0.63	0.69	0.33	1.10	1.68	3	19
2.30	...	10.96	1.90	1,05	0.51	1.91	4.53	...	20
0.97	...	3.63	0,43	0.41	0.19	0.10	1.26	—	21
1.72	22	8.14	0.77	0,72	0.36	1.14	3.33	22	22
1.87	4	9.60	0.70	0,85	0.36	1.48	4.11	4	23
1.47	7	6.45	0.67	0.61	0 35	0.83	3.04	7	24
1.60	5	8.73	0.60	0.65	0.36	1.18	2.73	5	25
2.10	—	...	0.27	0.32	...	...	...	...	25a
1.63	1	...	0.52	0.55	0.51	0.31	0.86	1	26
1.18	1	...	0.40	0.49	0,38	0.28	0.69	1	27
1.00	1	...	0.50	0,35	0.45	0,44	0.52	1	28
1.99	1	...	0.52	0.93	0.89	0.67	2.56	1	29
1.18	1	...	0.44	0.66	0.94	0.98	1.08	1	30
1.69	1	...	0.49	0.57	0.89	0,39	1.13	1	31
1.84	1	3.90	1.04	0.34	0.38	0.07	1.65	1	32
1.58	6	6.87	0.95	0.59	0.37	0.92	1.40	6	33
3.72	...	—	1.30	0.89	...	—	—	...	33a
5.18	...	...	0.72	0.55	...	...	...	...	33b

Average percentage composition of Indian

S. No.	Name	Place of origin	Total ash	Ash sol. in HCl	Organic constituents		
					Crude protein	Carbohydrates	
						Fibre	Nitrogen-free extract
34	Grass—*Chotijargi* (*Bothriochloa pertusa*) 1st cut ...	Bareilly ...	12.31	...	5.44	36.49	44.63
35	Ditto 2nd cut...	,, ...	11.32	...	3.86	35.68	48.01
36	Ditto 3rd cut ...	,, ...	11.28	...	3.19	36.50	47.76
37	Grass—*Dal* (*Hymenachne amplexicauis*) flowering stage	Assam ...	12.20	...	9.38	22.10	54.02
38	Grass—*Dedi* (*Gramineae ischaemum Rugosum* Salisb)	Bihar (Chaibasa forest)	9.00	3.02	4.31	27.30	58.37
39	Grass—*Dhub* (*Cynodon dactylon*) ...	Bangalore..	11.74	6:82	12.72	31.00	42.42
40	Grass - *Dub* (young)	,, ...	13.54	7.84	14.75	...	...
41	Ditto (prime)	,, ...	11.91	6.08	11.07		...
42	Ditto (ripe)	,, ..	9.31	4.85	8,44	...	...
43	Ditto (young) ...	Bihar ...	15.07	9.94	7.61	...	...
44	Ditto (prime)	,, ..	13.10	6.71	7.74	...	...
45	Ditto (ripe)	,, ...	10.72	5.26	5.81	...	...
46	Ditto (maximum)	Punjab ...	13.97	7.38	21.94	39.74	55.40
47	Ditto (minimum)	,, ...	7.79	2 27	4.90	18.63	41.97
48	Ditto (avegrage)	,, ..	11.75	5.60	10.47	28.17	47.81
49	Ditto (young)	,, ...	12.58	6.20	21.94	18.63	44.14
50	Ditto (prime)	,, ...	12.65	5.69	10.04	31.89	44.00
51	Ditto (ripe)	,, ...	7.79	2.27	4.90	39.74	46.07
51a	Grass—Dhus (*Eraianthus longsetosus*) Early cut ...	Assam ...	9.20	...	8.00	35.00	45.55
51b	Grass—Dhus (*Eraianthus longsetosus*) Late cut ...	,, ...	9.19	...	7.50	32.20	48.80
52	Grass—*Dila or motha* (*Cypeius tria*) Ripe stage ...	Punjab ...	8.61	3.63	6.04	32.77	51.61
53	Grass—Elephant (*Pennisetum purpureum*	,, ...	16.04	10.16	6.16	28.07	47.47
54	Grass—Forest (*Amphilophis glabrastaff*)	Bihar Ranchi	8.48	2.51	5.66	22.80	60.86
55	Grass—Forest (*Gramineae helrobogon contortus* Roem) ...	Bihar (Prohat Range)	7.98	2.78	3.94	31.30	55.65
56	Grass - Forest (*Gramineae imperaat arundancea* Cyrill) ...	,, ..	4.88	3.52	3.56	33.90	56 26
57	Grass—*Ghamur* (*Panicum antidotale*) ripe stage ...	Punjab ...	7.97	3.84	7.26	40.47	43.11
58	Grass—Giant Star (*Cynodon plectostachyum*) 1st cut ...	Almora ..	11.86	...	12.19	26.60	47.70
59	Ditto 2nd cut ...	,, ...	11.21	...	9.44	30.36	48.09
60	Ditto 3rd cut	,, ...	8.22	...	7.19	32.72	51.01
61	Ditto 4th cut ...	.. ...	10.82	...	5.44	37.60	45.24
62	Garss—Guinea (*Panicum maximum*) maximum ...	Bangalore	16.07	10 09	13.96	41.76	49.96
63	Ditto minimum	,, ...	11.39	5.89	4.73	31.59	35.57
64	Ditto average ...	,, ...	13.87	7.25	7.69	37.33	39.44

DIX I

feeding stuffs on dry matter basis

Ether extract	No. of analyses	Mineral constituents: Ash sol; in HCl	CaO	P_2O_5	MgO	Na_2O	K_2O	No. of analyses	Serial No.
1.23	1	...	0.55	0,52	0 50	0.43	0.85	1	34
1.13	1	—	0.47	0.41	0.55	0.73	1.01	1	35
1.27	1	—	0.60	0,69	0.64	0.35	0,90	1	36
2.30	1	...	0.18	0,47	...	...	...	1	37
1.02	1	3.02	0.32	0.32	0.22	—	0.80	1	38
2.12	1	—	...	...	...	...	...	...	39
...	2	7.84	0.81	0.58	0.39	0.47	3.17	2	40
...	2	6.08	0.70	0.50	0.32	0.43	2.33	2	41
...	2	4.85	0.41	0.28	0.34	0.83	2.00	2	42
...	2	9.94	1.07	0.41	0.44	0.52	5.16	2	43
...	2	6.71	0.90	0.44	0.36	0.79	2.76	2	44
...	2	5.26	0.72	0.45	0.31	0.86	1,95	2	45
2.71	...	7.38	0.98	0.82	0.60	0,57	3.85	...	46
1.21	...	2.27	0.50	0.23	0.19	0.06	0.84	...	47
1.80	15	5.60	0.77	0.59	0.34	0.23	2.08	15	48
2.71	1	6.20	0.81	0.82	0.44	0.15	2.36	1	49
1 42	5	5.69	0.81	0,63	0,42	0.28	0.25	5	50
0.89	1	2.27	0.50	0.23	0.19	0,18	0.84	1	51
2,25	...	...	0.29	0.36	...	...	...	...	51a
3.40	...	...	0,29	0.23	—	...	...	—	51b
0.89	1	3.63	1.15	0.27	0.35	0.41	0.95	1	52
2.26	4	10.16	0.70	0.61	0.30	0.68	2.99	4	53
2.20	1	2.51	0.31	0,29	0.22	—	0.56	4	54
1.13	1	2.78	0.85	2.16	0,26	—	0.93	1	55
1.40	1	3.52	1.25	0.16	0.21	...	1.48	1	56
1.19	1	3.84	0.54	0,21	0.35	0.34	1.95	1	57
1.65	1	...	1.36	0.82	...	...	...	1	58
0 90	1	...	1.05	0.76	...	...	...	1	59
0.86	1	...	0.73	0.69	...	...	...	1	60
0.90	1	...	0.52	0,24	...	...	...	1	61
2.66	...	8,55	0,85	0.90	0.57	0.74	3.78	—	62
0 66	...	6.31	0.54	0.37	0.38	0.23	2.23	...	63
1.67	28	7.08	0.71	0.56	0,45	0,41	2.92	13	64

Average percentage composition of India

Srl. No.	Name	Place of origin	Total ash	Ash sol. in HCl	Organic constituents. Crude protein	Carbohydrates Fibre	Carbohydrates Nitrogen-free extract
65	Grass—Guinea (*Panicum maximum*) young ...	Bangalore	15.54	8.55	7.88	38.38	37.01
66	Ditto prime ...	,, ...	12.32	6.31	4.82	42.14	40.06
67	Ditto	Bengal ...	13.94	5.88	7.97	32.36	43,99
68	Ditto	Punjab ...	12.15	...	5.22	36.38	44.70
69	Ditto — ...	Madhya Pradesh			...	...	...
70	Grass—Gulra (*Chroysopogon montanus*) 1st cut ...	Saharanpur	9.73	...	6.13	36.84	46.05
71	Ditto 2nd cut ...	,, ...	8.73	...	4.64	36.67	48.78
72	Ditto 3rd cut ...	,, ...	10.78	...	4.45	31.60	51.59
73	Grass—(*Isci lima weighti*) early ...	Bombay	10.22	4.54	6.02	36.62	45.76
74	Ditto before flower ...	,, ...	10.31	3.61	4.21	38.87	45.59
75	Ditto in flower ...	,, ...	9.41	3.61	4.08	41.09	44.32
76	Ditto in seed ...	,, ...	10.55	2.87	3.21	37.39	47.73
76a	Grass—Joy Joha (*Ischaemum rugosum*)	Assam ...	10.07	...	7.13	29.80	50.50
77	Grass—*lampa* (*Aristida depressa*)	Punjab Simla Hills.	4.95	1.45	2.31	42.25	41.99
77a	Grass—*Kharika* (*Microtegium ciliatum*)	Assam ...	9.71	...	6.04	37.50	44.95
78	Grass—*Makra or Madhana* (*Elusine aegyptiaca*) milk stage ...	Punjab ...	12.46	8.65	7.25	33.74	45.32
79	Grass—Mixture (*Pennisetum cenchroides* and *Andropogon contortus*) ...	,, ...	12.80	4.45	3.06	35.01	48.14
80	Grass—Mixture (*Pennisetum cenchroides* and *Andropogon pertusus*) milk stage	,,	9.66	4.31	5.33	34.30	49.08
81	Grass—*Mushyal* (*Iscilima laxum*) before flower ...	Bombay ...	11.64	4.03	5.06	34.24	47.70
82	Ditto in flower —	,, ...	9.85	2,97	3,69	38.79	46.68
83	Ditto in seed ...	,, ...	11.80	2.51	2.79	34.52	49.79
84	Ditto ...	Madyhya Pradesh ...	...	—	...	...	—
84a	Grass—Nal (*Arundo donax*) young ...	Assam ...	15.05	...	13.20	28.50	41.30
85	Grass—Napier (*Pennisetum purpureum*)	Bengal ...	16.70	10.07	5.35	31.90	44.06
86	Grass—*Palwan* (*Andropogon pertusus*)	Punjab ...	10.42	5,87	8.78	33.00	46.13
87	Ditto flowering stage	,, ...	9.10	2.86	4.74	41.09	43.76
88	Ditto pro Milk stage	,, ...	10.01	3.31	3.14	35.20	50.54
89	Ditto milk stage —	,, ...	10.94	4.96	4.72	40.71	42.30
90	Ditto ripe stage ...	,, ...	9.82	3.06	4.81	36.27	48.31
91	Grass—*Panni* ripe stage (Andropogon Muricatus)	,, ...	12.60	6.09	4,84	36.60	44 78
91a	Grass—Para Grass (*Brachiar mutica*) (*Bnicvh brabinede*)	Banalore	11.21	...	11.98	28.22	45.70
92	Grass—*Sandhaur* (*Bothriochloa intermedia*) 1st cut ...	Bareilly ...	9,53	...	3.88	38.88	40.40
93	Ditto 2nd cut	,, ...	9.24	...	3.74	37.65	48.24
94	Ditto 3rd cut ...	,, ...	8.52	...	2.09	37.79	50.27
95	Gaass—Sudan (*Andropogon sorghum* var *sudanensis*)	Punjab -	14.39	7.49	5.68	27.03	51.01

DIX I

feeding stuffs on dry matter basis

Erher extract	No. of analyses	Mineral constituents: Ash sol; in HCl	CaO	P_2O_5	MgO	Na_2O	K_2O	No. of analyses	Serial No.
1.19	1	8.55	0.71	0.90	0.50	0.64	3.78	1	65
0.66	1	6.31	0.54	0.72	0,44	0,45	2.56	1	66
1.73	1	5.88	1.23	0.54	0.73	0.57	1.45	1	67
1.55	1	...	...	...	...	...	...	...	68
...	...	...	1.81	0.59	...	...	1.81	1	69
1.25	1	...	0.45	0.39	0.51	0.52	1.56	1	70
1.18	1	...	0.51	0.41	0.58	0.41	1.14	1	71
1.58	1	...	0.65	0.20	0.60	0.76	0.91	1	72
1.38	2	4.54	0.39	0.33	0.31	0.31	1.92	2	73
1.02	2	3,61	0.37	0.15	0.30	0.31	1.23	2	74
1.10	2	3.61	0.38	0.20	0.30	0.21	1.21	3	75
1.12	2	2.87	0 46	0.16	0.40	0 23	0.64	3	76
2.50	...	...	0.53	0.71	...	...	...	...	76a
1.50	1	1.45	0.49	0.12	0.23	0.17	0.38	1	77
1.80	...	...	0.45	0.28	...	...	...	...	77a
1.23	1	8.65	0.91	0.49	0.70	0.74	3.75	1	78
0.99	1	4 45	0.70	0.29	0.34	0,15	1'12	1	79
1,63	1	4.31	0.53	0.63	0.33	0.37	2.07	1	80
1.36	3	4.03	0.49	0.17	0.32	0.36	1.08	3	81
0.99	3	2,97	0.50	0.16	0.29	0,22	0.87	3	82
1.10	3	2.51	0.59	0.29	0.35	0.25	0.46	3	83
...	...	...	0.79	0.22	...	...	0.88	1	84
1.95	...	...	0.32	0.34	...	...	...	...	84a
1.89	1	10.07	0.46	0.80	0.37	0.30	4,80	1	85
1.67	7	5,87	0.78	0.56	0,33	0.12	2.29	7	86
1.31	2	2.86	0.47	0.29	0,21	0.14	2.09	2	87
1.11	2	3.31	0,61	0.32	0.27	0.13	1.20	2	88
1.33	2	4.96	0.69	0.47	0. 40	...	2.53	2	89
0.79	1	3,06	0.54	0,37	0.23	0.49	1.60	1	90
1.18	1	6.09	0.57	0.27	0.29	0.28	1.31	1	91
2.89	15	...	0.50	...	...	...	...	15	91a
1.31	1	—	0.57	0,47	0.53	0.50	1.18	1	92
1,13	1	...	0.49	0.41	0.51	0 53	1.08	1	93
1.33	1	...	0.50	0.43	0.47	0.31	0.92	1	94
1.89	5	7.49	1.19	1.33	0,50	0.08	1.99	5	95

Average percentage composition of Indian

S. No.	Name	Place of origin	Total ash	Ash sol. in HCl	Organic constituents: Crude protein	Carbohydrates: Fibre	Carbohydrates: Nitrogen-free extract
95a	Grass—Ulu grass (*Imperata arundinacea*	Assam ...	8.33	...	7.00	34.00	47.65
95b	Grass— cyrill) young prime ...	,, ...	8.18	...	5.52	52.40	51.00
95c	Grass— do ripe ...	,, ...	6.75	...	3.53	39.40	48.70
96	Grass—*Usar* (*Sporobolus arabicus*) 1st cut ...	Makhdoom-pur	9.39		9.11	31.52	48.56
97	Ditto 2nd cut ...	,, ...	9.57	...	7.96	33.85	46.71
98	Ditto 3rd cut ...	,, ...	7.81	...	4.64	34.64	51.88
99	Grass Miscellaneous—Full maturity ... *Andropogon annulatus*	Madhya Pradesh Nagpur Farm	...	...	...	...	...
100	,, *caricosus*	,, ...	...	...	...	...	...
101	,, *contortus*	,, ...	...	...	...	...	...
102	,, *monti kola*	,, ...	...	...	...	...	...
103	,, *pertusus* ...	,, ...	...	...	...	...	...
104	,, *pumilus*	,, ...	...	...	...	...	...
105	,, *purpureoseriecus*	,, ...	...	...	...	...	...
106	*Apludavaria*	,, ...	...	...	...	...	...
107	*Ischaemum laxum*	,, ...	...	...	...	...	...
108	*Ischaemum sulcatum*	,, ...	...	...	...	...	...
109	Grass from Adhartal Farm	,, ...	...	...	...	...	...
110	Ditto Betul Farm	,, ...	...	...	...	...	...
111	Ditto Bargaon Farm ...	,, ...	...	...	...	...	...
112	Ditto Buldana Farm ...	,, ...	...	...	...	...	...
113	Ditto Khandwa Farm ...	,, ...	...	...	...	...	...
114	Ditto Powarkheda Farm	,, ...	...	...	...	...	...
115	Ditto Raipur Farm ...	,, ...	...	...	...	...	...
116	Ditto Seoni Farm ...	,, ...	...	...	...	...	...
117	Ditto Sindewahi Fram ...	,, ...	...	...	...	...	...
118	Ditto Tellan kheri Farm	,, ...	...	...	...	...	...
119	Ditto Tharsa Farm	,, ...	...	...	...	...	...
120	Ditto Degnullah area	Punjab ...	9.12	4.97	7.21	32.29	50.01
121	Ditto the adjoining Degnullah area	,, ...	9.76	7.25	3.35	34.83	51.15
122	Gram green fodder (*Cicer arietinum*) ...	,, ...	9.07	7.48	10.88	33.05	44.91
123	Ditto whole plant	,, ...	11.38	8.06	11.28	27.16	47.96
124	*Guar* (*Cyamopsis Psoraloides*) ...	Madhya Pradesh Nagpur ...	12.72	10.74	8.56	29.99	47.00
125	*Ditto*	,, ...	...	...	...	...	...
126	*Jowar* (*Andropogon sorghum*) young	Bangalore	9.40	6.48	8.91	35.13	44.42
127	Ditto prime maximum	,, ...	12.08	6.78	10.05	41.14	53.13

DIX I

feeding stuffs on dry matter basis

Ether extract	No. of analyses	Mineral constituents: Ash sol; in HCl	CaO	P_2O_5	MgO	Na_2O	K_2O	No. of analyses	Serial No.
3.30	...	...	0.53	0.50	...	...	...	...	95a
3.21	...	...	0.41	0.43		...	...	...	95b
1.62	...	...	0.37	0.26	...		...	...	95c
1.42	1	...	0.41	0.53	1.00	2.15	0.86	1	96
1.91	1	...	0.35	0,76	0.77	1.84	0.86	1	97
1 03	1	...	0.39	0.51	0.65	1.55	0.69	1	98
...	...	...	0.58	0.24	...	...	1.40	1	99
...	...	...	1.14	0.14	...	...	2.36	1	100
...	...	...	0.45	0.33	...	—	0.41	1	101
...	...	—	0.87	0.48	...	—	0.63	1	102
...	...	—	0.76	0.32	—	...	0.94	1	103
...	...	—	0.86	0,37	...	...	1,39	1	104
...	...	...	0.75	0,32	...	...	2.13	1	105
...	...	...	0.59	0.55	...	...	1,16	1	106
...	...	...	0.59	0.22	—	...	0.51	1	107
...	...	...	0.52	0.33	...	...	0.50	1	108
...	...		0.49	0,12	...	—	0,17	1	109
...	...	...	0.58	0.28	...	...	0,93	1	110
...	...	...	0.57	0.06	...	...	0.44	1	111
...	...	...	0.39	0.05	...	...	0,54	1	212
...	...	...	0.51	0.04	...	...	0.35	1	113
...		...	0.73	0.18	...	...	0.87	1	114
...	...	...	0,67	0.21		...	0.34	1	115
...	...	...	0.69	0.24	...	...	0.97	1	116
...	...	—	0.47	0.07	...	...	0,35	1	117
...	...	...	0.54	0.36	—	...	2.50	1	118
...	...		0.45	0.18	...	...	0.55	1	119
1.37	1	4.97	0.43	0.47	0,61	1·04	1.12	1	120
0.91	1	7.25	0.53	0.32	0,62	1.44	1.50	1	121
2.09	2	7.48	1.79	0.52	0.44	0,86	2.77	2	122
2.22	4	8.06	1.98	0.57	0.47	0.35	2.60	4	123
1.73	2	10.74	3.20	0.38	1.05	0.34	2.55	2	124
...	...	...	5.42	0.42	...	...	3.94	1	125
2.14	6	...	0.51	0.57	0.45	0.45	2.68	1	126
2.38	...	...	...	...	...	...	—	...	127

Average percentage composition of Indian

Srl. No.	Name	Place of origin	Total ash	Ash sol. in HCl	Organic constituents. Crude protein	Carbohydrates Fibre	Carbohydrates Nitrogen-free extract
128	*Jowar* (*Andropogon sorghum*) prime minimum	Bangalore	5.91	3.53	3.42	27.23	43.10
129	Ditto prime average	,,	8.55	4.96	7.75	32.36	49.61
130	Ditto prime ripe	,,	8.06	4.85	4.63	38.66	47.49
131	Ditto age—9 to 10 1/2 weeks	Bihar ...	7.58	4.96	2.85	30.91	57.48
132	Ditto (18 weeks)	,, ...	5.68	2.41	3.49	30.89	58.49
133	Ditto young ...	Punjab ...	8.96	4.78	5.21	38.87	45.59
134	Ditto prime ...	,, ...	6.37	3.40	3.76	35.13	53.34
135	Ditto ripe ...	,, ...	7.11	3,50	3.87	33.68	53 78
135a	*Kachnar* (*Bauhinia variegata*)	Izatnagar ...	10.09	...	15.60	32.00	40.36
136	*Lobia* (*Dolichos lablab*)	Punjab ...	14.80	...	...	28.08	...
137	Lucerne (*Medicago sativa*) maximum	Bangalore ...	11.76	10.95	25.81	35.21	39.94
138	Ditto minimum	,, ...	9.42	0.03	16.85	26,97	30.24
139	Ditto average	,, ...	10.69	10.07	20.24	30.13	36.62
140	Ditto maximum	Punjab ...	17.66	15.44	26.60	43.66	46.23
141	Ditto minimum	,, ...	9.27	8.19	13.31	21.02	21.16
142	Ditto average	,, ...	14.10	11.73	19.90	29.51	34 68
143	Ditto	Bihar ...	14.49	12.32	22.71	21.54	38.39
144	Maize (*Zeanays*) ...	,, ...	8.15	4,99	6.74	35.95	47.07
145	Ditto ...	Lyallpur ...	8.98	...	7.62	25.73	56.20
146	*Moth* (*Phaseoleus aconitifolius*) ...	Punjab ...	15.53	12.42	12.12	30,70	39.95
147	*Methi* (*Trigonella foenumgraecum*) ...	,, ...	8.80	8.27	15.69	31.05	42.39
148	Oats (*Avena sativa*)	,, ...	13.91	10.81	14.63	32.88	36.44
149	,, French milk stage	,, ...	9.33	6.26	6.44	28.72	53.20
150	,, ripe	,, ...	9.36	7.30	9.24	34.82	44.78
151	Paker (*Ficus infectoria*)	Izatnagar ...	8.78	...	9.60	28.33	49.91
152	Peas (*Pisum sativa*) 11 1/2 weeks ...	Punjab ...	3.89	3.05	16.69	22.60	54.42
153	*Pipal* (*Ficus religiosa*)	Izatnagar ...	14.00	...	11.87	27.42	43.39
154	*Senji* (*Melilotus parviflora*) ...	Punjab ...	9.50	6.10	15.46	31.62	41.95
155	*Shaftai* (*Trifolium resupinatum*) ...	,, ...	17.66	13.95	21.51	16.90	42.02
156	*Shisham* leaves (*Dalbergia sissoo*) ...	,, ...	13.48	...	2.71	26.71	54.98
157	Soya beans (*Glycin hyspida*) ...	Bihar ...	9.40	8.73	12.56	23.69	52.13
158	Sun flower (*Helianthus annus*) ...	Punjab ...	15.38	...	11.94	23.98	45.26
159	Teosinte (*Euchlaeaua mexicana*) ...	Bihar ...	10.80	6.09	4.47	32.20	51.33
160	Velvet bean (*Stizolobium decringeanum*)	Punjab ...	14.93	...	15.14	19.27	48.53
161	Water hyacinth (*Eichhornia speciosa*)	Bengal ...	16.47	16.06	6.54	24.70	50.59
162	Wheat (*Triticum vulgare*)	Punjab ...	8.65	5.61	7.31	34.73	47.97
	Silage						
163	Grass	,, ...	14.44	4.79	7.77	33.75	42.55
164	Guinea grass (*Panicum maximum*) ...	Bangalore ...	9.90	4.69	5.23	38.73	44.61
165	*Jowar* (*Andropogon sorghum*) young ...	,, ...	14.58	8.04	7.17	39.24	37.22
166	Ditto prime maximum ...	,, ...	14.98	7.50	7.12	41.68	50.28
167	Ditto prime minimum ...	,, ...	6.80	3.85	4.94	29 36	40.87
168	Ditto prime average ...	,, ...	10.63	5.51	5.89	37.33	44.38
169	Ditto prime ripe ...	,, ...	6.49	2.80	4.48	41.56	45.91
170	Maize (*Zea Mays*)	Punjab ...	11.33	...	7.92	24.57	55.08
171	Oat (*Avana sativa*)	,, ...	9.54	...	7.73	40.29	45.01

DIX I

feeding stuffs on dry matter basis

Ether extract	No. of analyses	Mineral constituents: Ash sol; in HCl	CaO	P_2O_5	MgO	Na_2O	K_2O	No. of analyses	Serial No.
1.06	...	...	...	...	...	...	...	...	128
1.73	28	...	...	...	...		...	...	129
1.16	6	...	0.35	0.48	0.29	...	1.57	1	130
1.18	3	4.96	0.59	0.42	0.76	...	2.04	3	131
1.45	2	2.41	0.62	0.33	0,25	—	0.58	2	132
1.37	5	4.78	0.69	0.41	0.35	0.27	2.45	5	133
1.40	6	3.40	0.59	0.32	0.35	0.17	1.67	6	134
1.56	6	3.50	0.63	0.25	0.37	0.11	1.76	6	135
1.95	..	...	3.76	0.58	...	0.45	0.91	...	135a
3.50	2	...	2.77	0.60	0.97	0.55	3.52	2	136
3.08	...	...	...	...	—	...	...	...	137
1.34	...	...	...	..	...	...	...	—	138
2.32	6	...	1.73	0,79	0.41	0.72	4.38	1	139
2.63	—	15.44	3,64	1.12	0.79	0.53	4.93	—	140
1.08	...	8.19	1.94	0,38	0.26	0.06	2.21	...	141
1.81	14	11.73	2.80	0.74	0.44	0.35	4,11	14	142
2.87	1	...	...	...	...	...	...	—	143
2.09	3	4.99	0.73	0.63	0,74	—	1.61	3	144
1.47	1		...	...	...	—	...	...	145
1.73	1	12.42	3.60	0.62	0.79	0.07	3.80	1	146
2.07	1	8.27	2 06	0.51	0.42	0.30	2.77	1	147
2.14	7	10.81	0.67	0.76	0.37	1.09	5.28	7	148
2.31	3	6.26	0.66	0.50	0.37	0.70	3.43	3	149
1.80	1	7.30	0.49	0.35	0.21	0.87	2.93	1	150
3.38	1	...	3.22	0.68	...	...	...	1	151
2.40	1	3.05	1.63	0.60	0.31	...	0.91	1	152
3.32	1	...	3.68	0.55	...	...	...	1	153
1.47	4	6.10	1.89	0.42	0.44	0.34	2.21	4	154
1.91	4	13.95	2,79	0.76	0.56	0.67	4.87	4	155
2.42	3	...	...	...	...	...	...	...	156
2.22	1	8.73	1.87	0.57	1.39	...	2.35	1	157
3.44	1	...	...	...	...	...	...	...	158
1.20	1	6.09	1.07	0.37	0.49	...	2.24	1	159
2.13	1	...	...	...	...	...	...	...	160
1.70	1	...	...	...	...	...	...	...	161
1.31	2	5,61	0.41	0.36	0,31	0.11	3.29	2	162
1.49	2	...	...	...	...	...	...	...	163
1.53	2	...	...	...	...	...	...	...	164
1.79	3	...	...	...	...	...	...	...	165
2.61	...	...	...	...	...	...	...	...	166
1.05	...	...	...	...	...	...	...	...	167
1.77	21	...	0.64	0.40	0,42	...	2.48	1	168
1.57	1	...	...	...	...	...	...	...	169
1.10	1	...	...	...	...	...	...	...	170
2.29	2	...	...	...	...	...	...	...	171

APPEN

Average percentage composition of Indian

S. No.	Name	Place of origin	Total ash	Ash sol. in HCl	Organic constituents: Crude protein	Carbohydrates: Fibre	Carbohydrates: Nitrogen-free extract
✓172	*Ragi* straw (*Eleucine coracana*) ...	Bangalore	9.62	6.46	3.64	38.78	46.49
✓173	Rice straw (*Oryzasativa*)	,, ...	11.40	6.17	5.92	30.01	47.47
174	*Sisham* leaves (*Dalbergia sisoo*) ...	Punjab ...	14.41	...	3.18	27.53	51.60
175	Spear grass (*Andropogon contortus*) young	Hosur, Madras ...	12.22	5.30	6.62	36.85	43.05
176	Ditto prime ...	,, ...	15.53	5.39	6.59	32.60	43,63
✓177	Wheat straw (*Triticum vulgare*) ...	Punjab ...	14.62	3.76	3.47	39.38	42.06
	DRIED ROUGHAGES						
	Hays						
178	Ajjampur hay (young)	Mysore ...	12.47	6.36	7.77	36.85	41.00
179	Ditto (prime)	,, ...	11.60	5.63	5.44	39.22	42.80
180	Ditto (ripe)	,, ...	8.48	4.21	3.21	37.18	50.40
181	Ahmadnagar	Ahmad-nagar ...	16.31	2.30	3.85	36.91	41.95
182	Ambala hay	Punjab ...	10.72	6.26	5.55	35.84	46.47
183	*Andropogon annulatus* (early) ...	Bombay ...	13.58	5.55	9.70	33.03	42.51
184	Ditto (just before flower)	,, ...	10.81	3.40	5.20	38.50	44.47
185	Ditto (in flower) ...	,, ...	10.64	3.20	4.08	39.89	44.36
886	Ditto (in seed) ...	,, ...	11.46	2.33	2.68	39.07	45.63
187	Ditto (early) ...	Pusa (Bihar)	...	...	...	...	...
188	Ditto (in flower) ...	,, ...	...	...	...	...	...
189	Ditto (ripe) ...	,, ...	...	...	...	...	...
190	*Anjan hay* (*Pennisetum cenchroides*) early ...	Bihar ...	...	...	...	...	...
191	Ditto just before flower	,, ...	...	...	...	...	...
192	Ditto in flower ...	,, ...	...	...	...	...	...
193	Ditto dead ripe ...	,, ...	...	...	...	...	...
194	Ditto early ...	Bombay ...	...	...	...	...	...
195	Ditto in flower ...	,, ...	...	...	...	...	...
196	Ditto in flower ...	Bangalore	...	...	...	...	...
197	Ditto dead ripe ...	,, ...	...	...	...	...	...
198	Ditto ...	Meerut ...	10.18	4.60	4.87	32.91	51.21
199	*Anjan* hay (*Pennisetum cenchroides*) ...	Punjab ...	11.91	7.57	5.73	36.69	44.25
199a	Arali (*Leersia hexandra*)	Assam ...	14.92	...	6.32	31.40	45.90
200	Aurangabad hay	Aurangabad	16.13	2.61	2.45	36.26	43.60
201	Ditto (youug)	,, ...	14.48	2.23	4.16	40.65	39.56
202	Ditto (prime)	,, ...	15.40	2.47	2.58	37.78	42.81
203	Ditto (ripe)	,, ...	15.58	1.96	1.66	38.73	42.72
204	*Babbar* hay	Murree Hills ...	6.40	2.04	2.33	32.10	56.86
205	Bangalore hay	Military, Grass Farm	10.02	2.45	2.47	35.41	50.84
206	Belgaum hay	Belgaum ...	14.77	1.91	2.26	31.25	50.33
207	Bellary hay	Bellary Madras ...	14.04	2.66	2.44	36.90	45.36
208	*Bir* hay	Hissar Farm Punjab ...	11.24	6.47	5.51	29.67	52.56

DIX I

feeding stuffs on dry matter basis

Ether extract	No. of analyses	Mineral constituents: Ash sol; in HCl	CaO	P_2O_5	MgO	Na^2O	K_2O	No. of analyses	Serial No.
1.47	1	...	...	...	...	...	...	...	172
1.66	3	...	...	...	...	...	...	...	173
3.28	2	...	...	...	...	...	...	...	174
1.26	1	...	...	...	...	...	...	...	175
1.65	4	...	...	...	...	...	...	...	176
0.47	2	...	...	...	...	...	...	...	177
1.06	1	6.36	0.84	0.44	0.41	0.07	2.90	1	178
0.95	1	5.63	0.56	0.44	0.39	0.18	2.18	1	179
0.74	1	4.21	0.51	0.15	0.49	0.13	0.82	1	180
0.98	1	...	...	...	...	...	...	...	181
1.42	1	6.26	0.57	0.67	0.24	0.87	2.53	1	182
1.18	4	5.55	0.64	0.56	0.35	0.44	2.15	4	183
1.02	7	...	0.66	0.33	0.34	0.43	1.26	4	184
1.03	8	...	0.58	0.24	0.29	0.27	1.08	4	185
1.16	8	...	0.56	0.11	0.30	0.35	0.50	4	186
...	...	...	1.00	0.52	0.26	0.62	2.50	2	187
...	...	...	0.63	0.44	0.21	0.15	0.81	1	188
...	...	...	1.15	0.46	0.21	0.13	0.44	1	189
...	...	...	0.75	0.64	0.38	1.14	4.07	4	190
...	...	...	0.70	0.57	0.38	1.27	4.13	3	191
...	...	...	0.63	0.42	0.38	1.17	3.99	1	192
...	...	...	0.63	0.69	0.33	1.10	2.02	3	193
...	...	...	0.50	0.23	0.61	1.13	0.66	1	194
...	...	...	0.60	0.21	0.72	1.02	0.61	1	195
...	...	...	0.45	0.56	0.37	1.27	3.30	4	196
...	...	...	0.42	0.39	0.39	0.89	1.67	2	197
0.83	2	4.26	0.36	0.72	0.31	1.36	1.61	1	198
1.42	1	...	0.43	0.42	0.28	0.10	2.09	1	199
1.50	...	...	0.20	0.32	...	...	...	...	199a
1.56	3	2.47	0.73	0.11	0.31	0.20	0.69	2	200
1.15	1	2.23	0.57	0.19	0.34	0.23	0.67	1	201
1.43	1	2.47	0.51	0.13	0.28	0.29	0.59	1	232
1.31	1	1.96	0.55	0.05	0.26	0.39	0.23	1	203
2.31	1	2.04	0.65	0.05	0.24	0.31	0.26	1	204
1.26	8	...	...	...	...	...	...	...	205
1.39	2	1.91	0.55	0.08	0.36	0.18	0.30	2	206
1.28	5	2.66	0.79	0.07	0.42	0.31	0.57	5	207
1.02	2	6.47	0.48	0.42	0.36	0.79	2.50	2	208

Average percentage composition of Indian

S. No.	Name	Place of origin	Total ash	Ash sol. in HCl	Organic constituents: Crude protein	Carbohydrates: Fibre	Carbohydrates: Nitrogen-free extract
209	*Boda* hay	Cuddapah Madras ...	6.99	2.45	3.74	40.55	47.38
210	Bolarum hay	Bolarum Deccan ...	3.30	2.96	2.81	37.00	45.45
211	Ditto (young)	,, ...	2.98	4.34	5.06	36.04	44.76
212	Ditto (prime)	,, ...	2.49	3.49	3.81	36.98	45.64
213	Ditto (ripe)	,, ...	9.44	1.75	1.98	38.20	49.44
214	*Dal* hay	Assam ...	2.90	...	7.50	29.26	48.97
215	Dalhousie hay	Dalhousie	9.33	2.51	3.41	38.63	47.75
216	*Dub* hay	Bangalore	14.97	6.04	11.06	25.86	46.19
217	Ditto	Bareilly ...	11.08	4 85	9.08	24.40	54.48
218	Ditto	Fyzabad ...	12.10	5.98	7.68	23.23	53.66
219	Ditto	Lucknow...	10.07	4.56	7.51	20.77	61,84
220	Ditto	Karnal ...	12.48	4.62	6.76	24.15	55.99
221	Ditto	Lyallpur ...	12.54	...	11.10	18.38	56.60
222	Ferozepur hay	Ferozepur	11.57	7.27	8,96	32.93	45,51
223	Guinea grass hay (before flowering) ...	Bangalore	16.00	9.83	7.56	38.14	37.08
224	Ditto (*in* flower) ...	,, ...	12.30	6.10	4.76	42.10	39.69
225	*Jarewah* hay	Lucknow ...	11.56	3.65	3.50	35.21	47.57
226	Jhelum hay	Jhelum ...	9.63	5.25	5.15	29.93	54.08
227	*Jowar* hay (*Andropogon sorghum*) young	Bangalore	9.77	6.68	6.88	40.70	41.30
228	Ditto prime	,, ...	8.51	4.57	4.30	38.93	47.10
229	Ditto ripe	,, ...	7.62	4.57	4.41	42.07	44.82
230	*Jowar* hay	Punjab ...	10.23	4.75	5.42	37.76	44.96
230a	Joy Joha (*Ischaemum rugosum*) ...	Assam ...	9.63	...	6.63	33.72	47.84
231	Jubbalpore hay (young)	Jubbalpore	10.77	4.26	4.15	38.72	44.92
232	Ditto (prime)	,, ...	8.63	3.07	3.24	39.28	47.73
233	Ditto (ripe)	,, ...	11.96	2.45	2.58	39.55	44.88
234	Jullundur hay	Jullundur...	8.15	3.64	3.51	40.1	47.24
235	Jutogh hay	Jutogh ...	7.33	3.11	3.74	39.37	48.16
236	Kasauli hay	Kasauli ...	8.76	3.84	4.19	36.90	48.41
237	*Kollukattai* grass hay (young) ...	Hosur, Madras ...	12.70	8.88	16.89	28.49	40.78
238	Ditto (prime) ...	,, ...	10.90	7.01	10.01	35.33	42.60
239	Ditto (ripe) ...	,, ...	9.93	5.28	6.38	33.30	49.71
240	Lahore hay	Lahore ...	9.76	4.61	4.38	38.76	45.70
241	*Lunder* hay (*Anthistiria anathera*) ...	Murree Hills	7.20	1.76	1.56	39.79	49.64
242	Meerut Farm hay	Meerut ...	10.98	2.87	2.92	38.63	46.56
243	Ditto (young)	,, ...	14.64	4.09	3.54	32.61	47.60
244	Ditto (prime)	,, ...	14.03	3.65	2.92	31.97	49.52
245	Ditto (ripe)	,, ...	12.71	3.15	2.87	37.20	46.17
246	Multan hay (Geneva)	Multan ...	10.68	4.44	2.98	39.20	45.91
247	Ditto (Musel)	,, ...	11.22	4.46	3.15	36.37	48.29
248	Murree hay	Murree ...	7.35	2.74	3.68	43.89	43.17
248a	Nal (*Arundo donax*)	Assam ...	12.40	...	8.81	33.00	44.73
249	Natal grass hay (*Tricholaena rosea*) ...	Mysore ...	7.99	4.47	5.61	41.61	43.39

DIX I

feeding stuffs on dry matter basis

Ether extract	No. of analyses	Mineral constituents: Ash sol; in HCl	CaO	P_2O_5	MgO	Na_2O	K_2O	No. of analyses	Serial No.
1.34	1	2.45	0.40	0.14	0.29	0.21	0.82	1	209
1.44	19	...	0.72	0.08	0.44	0.28	0.53	12	210
1.16	1	4.34	0.73	0.24	0.37	0.44	0.43	1	211
1.15	1	3.49	0.75	0.22	0.32	0.35	0.90	1	212
1.86	1	1.75	0,50	0.09	0.27	0.34	0.17	1	213
1.43	1	...	0.20	0.46	...	...	...	1	214
0.88	1	2.51	0.76	0.15	0,19	0.15	0.44	1	215
1.90	4	...	...	...	...	...	...	...	216
0.96	1	4.85	0.70	0.44	0.31	0.40	1.53	1	217
3.33	1	5.98	0.72	0.52	0.46	0.26	1.51	1	218
0.51	1	4.56	0.55	0.59	0.24	0.44	2.53	1	219
0.62	1	4.62	0.49	0.60	0.23	0.99	1.03	1	220
1.38	1	...	...	...	...	...	...	...	221
1.04	1	7.27	0.70	0.56	0.32	0.82	2.28	1	222
1.22	1	...	...	...	...	...	...	...	223
1.15	1	...	...	...	...	...	...	...	224
2.16	1	3.65	0.41	0.36	0.20	0.28	1.48	1	225
1.21	6	5.25	0.67	0.35	0.38	0.46	1.63	1	226
1.35	5	...	0.38	0.54	0.45	0.26	3.39	1	227
1.16	16	...	0.38	0.33	0.33	0.26	1.67	13	228
1.08	1	...	0.32	0.56	0.31	0.32	1.90	2	229
1.63	...	...	0.52	0.55	...	...	...	...	230
2.18	8	4.75	0.68	0.62	0.45	0.17	2.49	8	230a
1.44	1	4.26	0.68	0.32	0.34	0.23	1.55	1	231
0.12	1	3.07	0.48	0.15	0.33	0.36	1.12	1	232
1.03	1	2.45	0.50	0.28	0.26	0.03	0.90	1	233
0.99	1	3.64	0.57	0.41	0.22	0.30	1.55	1	234
1.40	1	3.11	0.80	0.42	0.35	0.22	1.30	1	235
1.74	1	3.84	1.01	0.21	0.29	0.26	0.69	1	236
1.14	1	...	...	...	...	...	...	...	237
1.16	1	...	...	...	...	...	...	...	238
0.68	1	...	...	...	...	...	...	...	249
1.40	1	4.61	0.67	0.35	0.20	0.48	1.81	1	240
1.81	1	1.76	0.60	0.03	0.10	0.10	0.37	1	241
0.91	4	2.71	0.59	0.33	0.28	0.41	0.82	2	242
1.61	2	4.26	0.38	0.53	0.22	0.18	2.00	1	243
1,56	2	3.92	0.39	0.42	0.26	0.27	1.74	1	244
1.06	3	...	...	...	...	...	...	...	245
1.23	1	4.44	0.60	0.20	0.17	0.27	1.07	1	246
0.97	1	4.46	0.83	0.22	0.18	0.18	1.09	1	247
1.91	...	...	0.22	0.35	...	...	...	...	248
1.06	1	2.74	0.91	0.11	0.26	0.49	0.81	1	248a
1.40	1	4.47	0.48	0.25	0.49	0.25	1.96	1	249

Average percentage composition of Indian

Srl. No.	Name	Place of origin	Total ash	Ash sol. in HCl	Organic constituents. Crude protein	Carbohyd rates Fibre	Carbohyd rates Nitrogen-free extract
250	Oat hay (*Avuna sativa*)	Lahore ...	8.40	4.91	5.23	28.90	56.44
251	Ditto	Punjab ...	8.34	5.19	5.60	35.92	48.45
252	Rawalpindi hay	Rawalpindi	8.21	2.62	4.08	38.37	47.73
253	Rhodes grass hay (*Chloris gayana*) ...	Bangalore...	12.14	7.92	12.33	27.28	45.84
254	Ditto (young) ...	Hosur, Madras ...	10.40	4.48	7.51	36.57	44.31
255	Ditto (prime) ...	,, ...	11.08	5.43	9.36	36.16	42.14
256	Ditto (ripe) ...	,, ...	9.08	3.88	6.36	39.31	44.09
257	*Roosa* hay	Murree Hills	8.35	2.44	2.63	33.54	53.18
258	*Rukh* hay	Bolarum ...	8.04	2.20	2.34	41.18	47.18
259	Ditto (ripe)	,, ...	13.10	2.80	2.74	31.40	51.80
260	*Rukh* hay	Jubbulpore	9.94	1.78	2.33	28.87	57.95
261	Ditto	Kirke, Poona	17.17	2.12	2.53	34.12	45.30
262	Scented grass hay	Cuddapah, Madras ...	7.21	3.92	6.49	35.77	47.26
263	Seguri hay	Seguri ...	9.92	1.90	5.84	38.44	44.80
264	Sialkot hay	Sialkot ...	10.09	3.57	4.83	38.65	45.46
265	Spear grass hay (*Andropogon contortus*) early	Bangalore	...	...	...	...	...
266	Ditto just before flower...	,, ...	...	...	...	...	...
267	Ditto in flower ...	,, ...	8.76	3.46	5.61	38.21	46.00
268	Ditto in seed ...	,, ...	9.74	2.07	3.18	37.39	48.22
269	Ditto young	Hosur, Madras ...	9.22	4.27	6.97	34.52	47.94
270	Ditto prime	,, ...	9.73	3.50	5.30	36.89	46.89
271	Ditto ripe	,, ...	9.03	3.30	2.97	38.32	48.75
272	Ditto early	Bombay ...	13.31	3.36	5.88	33.58	46.11
273	Ditto before flower ...	,, ...	11.06	3.17	4.42	38.64	44.87
274	Ditto in flower ...	,, ...	8.85	2.78	3.71	40.27	46.23
275	Ditto in seed... ...	,, ...	10.86	2.19	1.72	38.23	48.29
276	Ditto early	Bihar ...	...	...	...	...	...
277	Ditto in flower ...	,, ...	...	...	...	...	...
278	Ditto ripe	,, ...	...	...	...	...	...
279	Spear grass hay	Uttar Pradesh ...	10.11	1.80	2.28	33.74	53.07
280	Ditto	Murree Hills	6.58	3.38	5.35	36.84	49.63
281	Star grass hay (*Cynodon plectostachyum*)	Almora ...	10.82	...	5.44	37.60	45.24
282	Suggr cane leaves	Bangalore ...	6.09	3.18	2.64	37.18	52.73
283	*Swank* hay	Sargodha ...	7.97	3.84	7.26	40.47	43.11
284	*Takira* hay	Murree Hills	6.69	2.35	2.47	31.64	57.19
285	Telegaon hay	Telegaon ...	15.72	2.34	2.72	37.47	43.12
286	Tornagallu hay	Tornagallu	11.60	2.47	2.22	37.52	47.45
287	*Uridul* hay (*Oryza sativa* var, *falua*) ...	Assam ...	...	...	8.19	32.00	42.31
288	*Usar* grass hay	Etawah ...	8.84	...	6.12	34.39	49.63
288a	Venezuele (*Mlinis minustiflora*) pre-flowering	Izatnngar ...	8.83	...	4.38	37.78	47.99

DIX I

feeding stuffs on dry matter basis

Ether extract	No. of analyses	Mineral constituents: Ash sol; in HCl	CaO	P_2O_5	MgO	Na_2O	K_2O	No. of analyses	Serial No.
1.03	1	...	...	...	...	...	...	...	250
1.69	14	5.19	0.46	0.38	0.22	0.70	2.44	14	251
1.61	2	2.36	0.82	0.13	0.19	0.34	0.77	2	252
2.41	2	...	...	...	...	...	...	...	253
1.21	1	4.48	0.59	0.45	0.31	1.08	3.03	1	254
1.16	1	5.43	0.42	0.23	0.17	0.97	1.30	1	255
1.26	1	...	...	...	...	...	...	...	256
2.30	1	2.44	0.79	0.07	0.28	0.27	0.32	1	257
1.26	9	1.98	0.42	0.17	0.31	0.45	0.60	2	258
0.96	1	...	...	...	...	...	...	...	259
0.91	2	1.78	0.51	0.14	0.27	0.24	0.42	2	260
0.88	2	2 12	0.50	0.06	0.31	0.45	0.38	2	261
3.27	1	3.92	0.52	0.19	0.25	0.39	1.70	1	262
1.00	1	...	...	...	...	...	...	...	263
0.97	1	3.57	0.54	0.43	0.19	0.33	1.84	1	264
...	...	...	0.55	0.42	0.34	0.23	2.33	3	265
...	...	...	0.56	0.43	0.42	0.27	3.21	1	266
1.42	1	...	0.42	0.21	0.26	0.24	1.22	3	267
1.47	1	...	0.39	0.18	0.26	0.22	1.04	1	268
1.35	1	...	...	...	...	...	...	...	269
1.19	5	...	...	...	...	...	...	...	270
0.96	6	...	...	...	...	...	...	...	271
1.12	4	...	0.47	0.30	0.39	0.25	1.41	5	272
1.01	6	...	0.47	0.29	0.30	0.39	1.23	6	273
0.94	6	...	0.42	0.23	0.25	0.30	0.96	7	274
0.90	5	...	0.48	0.17	0.21	0.33	0.50	8	275
...	...	...	0.59	0.36	0.27	0.24	1.74	3	276
...	...	...	0.47	0.25	0.24	0.31	1.21	3	277
...	...	...	3.84	0.23	0.25	0.38	0.74	1	278
0.80	3	1.82	0.41	0.19	0.20	0.41	0.38	3	279
1.60	1	3.38	0.63	0.20	0.28	0.15	1.10	1	280
0.90	1	...	0.52	0.24	...	...	...	1	281
1.36	1	3.18	0.55	0.14	0.37	0.46	1.00	1	282
1.19	1	3.84	0.54	0.21	0.35	0.34	1.95	1	283
2.01	1	2.35	3.89	0.07	0.17	0.11	0.33	1	284
0.97	1	...	...	...	...	...	...	...	285
1.21	3	2.47	0.63	0.63	0.37	0.45	0.53	3	286
1.76	1	...	...	...	...	...	...	1	287
1.02	1	...	0.30	0.33	...	...	...	1	288
1.02	...	...	0.76	0.71	0.66	...	...	...	288a

Average percentage composition of Indian

Srl. No.	Name	Place of origin	Total ash	Ash sol. in HCl	Organic constituents. Crude protein	Carbohydrates Fibre	Carbohydrates Nitrogen-free extract
288b	Venezuele (*Melinis minustiflora*) flowering	Izatnagar...	10.14	...	4.19	36.80	48.45
289	Wheat hay	Punjab ...	7.23	3.51	5.06	35.12	51.32
	Legume hays						
290	Berseem hay	,, ...	12.13	10.89	14.70	30.56	40.99
291	Cluster been hay	Mysore ...	16.51	13.47	25.21	13.82	43.59
292	Cowpea hay	Mysore ...	13.32	10.19	15.31	34.84	35.44
293	Gram hay	Punjab ...	11.17	8.26	12.91	35.33	38.14
294	Groundnut hay	Mysore ...	14.81	11.73	21.51	24.54	38.19
295	*Kalai* (*Dolichos biflores*)	Sabour ...	13.09	7.99	10.56	16.20	58.34
296	*Lobia* hay (*Dolichos lablab*)	Sargodha	12.51	...	...	36.12	...
297	Lucerne hay	Bangalore	12.74	7.64	21.26	29.41	35.18
298	*Moth* hay (*Phaseoleus aconitifolius*) ...	Punjab ...	13.75	10.07	10.59	26.75	47.06
299	Pea hay (*Pisum sativum*)	Sargodha ...	7.66	6.13	10.94	29.17	50.32
300	Soya bean hay	Mysore ...	12.04	10.02	14.96	29.13	42.59
	DRIED ROUGHAGES						
	Straws						
301	*Apluda aristata* Linn	Palamau Forest Bihar	8.13	6.83	6.90	28.27	...
302	Barley stalks	Sargodha Punjab ...	6.08	4.74	2.97	38.59	51.32
303	Barley straw	Mona, Punjab ...	8.05	5.40	2.21	47.39	41.43
304	*Batasad*	Goilkera Forest Bihar	9.19	7.47	6.48	39.86	...
304a	Bhurra (*Saccharum muni*)	Izatnagar ...	6.51	2.51	4.05	39.99	47.47
305	*Chrysopogon monticola* Trin ...	Palamaw Forest Bihar	9.60	...	4.48	26.48	57.58
306	Gramineae *Alpudavaria Amutican* L.... Inc. *A. aristata* Willd.	Prohat Range Forest Bihar ...	10.23	8.77	5.88	26.42	...
307	Gram stalks	Punjab ...	6.17	3.96	4.51	53.81	34.84
308	Gram straw	,, ...	13.31	...	6.01	44.45	35.70
309	*Jankai* (*Phragmites karka*) ...	Goilkera Forest, Bihar	15.81	13.65	3.77	29.79	...
310	*Jowar* straw	Bangalore	9.82	5.45	4.91	34.17	49.55
311	*Khorpo bumbee* (*Chrysopogon lancearins*)	Goilkera Forest, Bihar	16.31	14.50	4.71	27.64	...
312	*Lupeed dumbu* (*Eulalia cumingii*) ...	,, ...	8.49	7.44	6.90	38.67	...
313	Millet straw	Bangalore	17.51	5.95	5.39	32.32	43.51
314	*Oplismenus burmannii* Beauy ...	Palamaw Forest, Bihar	14.91	13.56	1.31	20.70	...
315	Ragi straw (Eleusine coracana) ...	Bangalore	8.10	5.35	3.67	35.93	51.38
316	Rice straw (Oryzo sativa)	,, ...	17.28	4.41	2.92	33.36	45.58

DIX I

feeding stuffs on dry matter basis

Ether extract	No of analyses	Mineral constituents: Ash sol; in HCl	CaO	P_2O_5	MgO	Na_2O	K_2O	No.of analyses	Serial No.
1.12	...	...	0.52	0.66	0.67	...	...	...	288b
1.27	1	3.51	0.30	0.50	0.39	0.05	1.79	1	289
1.62	1	10.89	2.07	0.65	0.61	0.58	3.89	1	290
0.87	1	13.47	3.39	0.61	1.51	0.20	3.29	1	291
1.09	2	10.19	2.27	0.40	0.70	0.25	2.89	2	292
1.46	2	8.26	2.14	0.46	0.48	0.33	2.99	2	293
0.95	2	...	2.65	0.58	1.25	0.18	3.26	1	294
1.81	1	7.99	2.54	0.42	1.00	...	1.20	1	295
2.25	1	...	3.78	0.36	1.03	0.75	2.14	1	296
1,41	1	...	...	...	...	...	...	...	297
1.85	1	10.07	3.27	0.42	0.96	0.88	2.16	1	298
1.91	1	6.13	1.58	0.48	0.33	0.19	2.02	1	299
1.29	1	10.02	2.86	0.60	1.20	0.30	2.02	1	300
...	1	6.83	0.48	0.23	0.29	.....	1.23	1	301
1.04	2	4.74	0.46	0.19	0.34	0.27	1 58	2	302
0.92	2	5.40	0.44	0.16	0.15	0.29	2.71	2	303
...	1	7.47	0.83	0.39	0.67	.....	0.31	1	304
2.08	...	...	0.37	0.38	0.28	0.22	1.17	...	304a
1.86	1	...	0.64	0.19	0.15	.....	1.28	1	305
...	1	8.77	0.70	0.29	0.25	.....	2.03	1	306
0.67	5	3.96	0.47	0.27	0.36	00.8	2.91	5	307
0.53	1	...	...	...	...	.....	...	...	308
...	1	13.65	1.03	0.23	0.51	.....	1.02	1	309
1.44	10	...	...	...	.....	.....	...	...	310
...	1	14.50	1.86	0.62	1.22	.....	2.23	1	311
...	1	7.44	0.89	0.21	0.94	.....	1.72	1	312
1.27	1	...	...	...	...	...	...	...	313
...	1	13.56	0.93	0.39	0.36	...	0.08	1	314
0.92	55	...	1.11	0.16	0.45	0.26	1.50	12	315
0.86	23	...	0.50	0.15	0.28	0.50	1.63	14	316

Average percentage composition of Indian

S. No.	Name	Place of origin	Total ash	Ash sol. in HCl	Organic constituents		
					Crude protein	Carbohydrates	
						Fibre	Nitrogen-free extract
317	Rice Straw (Aman)	Bengal ...	14.18	3.87	3.25	33.63	47.91
318	Ditto (Aus)	,, ...	12.84	4.08	5.04	34.92	45.63
319	Ditto (Boro)	,, ...	21.94	3.81	5.69	29.07	41.71
320	Ditto	Kanke Farm, Bihar. ...	15.20	2.50	3.75	30.70	49.40
321	Ditto	Pusa, Bihar	17.28	4.41	2.92	33.36	45.58
322	Ditto	Kangrah, Punjab ...	16.49	7.46	2.40	36.49	43.75
323	Ditto	Karnal, Punjab ...	20.39	6.05	3.75	30.61	43.67
324	Rolega (Schima nervosum)	Goilkera Forest, Bihar	8.88	7.22	4.46	24.53	...
325	Rottboclia exaltata	Palamau Forest, Bihar	10.80	...	5.25	31.13	52.02
326	Schizachyrium brevifolium Nees ...	,, ...	12.10	10.70	4.66	26.11	...
327	Tonto Jono	Goilkera Forest, Bihar	9.21	7.66	5.45	25.04	...
✓ 328	Wheat bhoosa	Karnal, Punjab ...	14.07	3.13	2.39	39.55	42.97
✓ 329	Wheat straw	Pusa, Bihar	11.30	6.39	3.28	42.14	41.66
330	Ditto	Karnal, Punjab ...	11.83	3.91	3.26	38.51	45.24
	CONCENTRATES						
	Grains and seeds						
331	Babul pods (Acacia beans)	Pusa, Bihar	5.47	5.30	15.77	12.44	65.52
332	Ditto ripe	,, ...	6.24	6.09	14.91	16.50	59.56
333	Babul seed (crushed)	Karnal ...	7.43	5.73	14.64	14.80	59.87
334	Barley	Bangalore	4.53	2.68	9.48	5.23	79.09
335	Ditto	Mona, Punjab ...	3.21	2.38	11.50	5.39	78.84
336	Ditto	Lyallpur ...	2.69	...	10.12	6.85	77.43
337	Barley heads	Punjab ...	4.79	2.56	9.89	20.21	64.00
338	Cotton seed	,, ...	4.66	...	18.02	25.74	30.98
339	Gram	Bangalore...	3.48	3.10	21.63	9.72	62.09
340	Ditto	Pusa ...	3.59	3.43	20.19	9.81	62.19
341	Ditto	Lyallpur ...	2.63	...	19.63	7.50	65.40
342	Ditto (grain)	Punjab ...	3.05	3.42	18.06	9.83	63.67
343	Ditto (grain with pods)	,, ...	9.08	8.38	16.18	23.79	48.18
344	Groundnut (kernel)	,, ...	2.15	2.10	31.28	1.39	13.61
345	Horse gram	,, ...	5.10	3.95	24.74	4.82	64.38
346	Linseed	Lyallpur ...	5.25	...	19.22	6.78	32.64
347	Kulthi (Dolichos biflorus)	Bangalore	7.77	...	22.46	6.10	58.48
348	Maize	Punjab ...	1.94	...	11.11	1.90	80.66
349	Ditto	Lyallpur ...	1.85	...	10.55	2.20	82.10

DIX I

feeding stuffs on dry matter basis

Ether extract	No. of analyses	Mineral constituents: Ash sol; in HCl	CaO	P_2O_5	MgO	Na_2O	K_2O	No. of analyses	Serial No.
1.03	6	3.91	0.71	0.12	0.30	0.27	1.78	4	317
1.57	3	3.83	0.64	0.18	0.40	0.21	2.03	1	318
0.94	1	...	...	...	...	...	...	...	319
0.95	1	2.50	0.19	0.25	0.10	...	1.43	1	320
0.86	23	...	...	...	...	...	...	...	321
0.87	1	7.46	0.40	0.25	0.24	0.44	2.31	1	322
1.55	8	...	...	...	...	...	...	...	323
...	1	7.22	0.71	0.27	0.60	...	2.35	1	324
0.80	1	...	0.43	0.30	0.26	...	2.07	1	325
...	1	10.70	0.76	0.16	0.28	...	0.98	1	326
...	1	7.66	1.02	0.36	0.51	...	1.67	1	327
1.02	1	3.13	0.42	0.15	0.11	0.28	1.25	1	328
1.62	1	...	...	...	...	...	...	...	329
1.16	5	...	...	...	...	...	...	...	330
0.80	2	...	...	...	...	...	...	...	331
2.79	1	...	...	...	...	...	...	...	332
3.26	1	...	...	...	...	...	...	...	333
1.67	1	...	...	...	...	...	...	...	334
1.06	1	2.38	0.25	0.85	0.21	0.05	0.56	1	335
2.91	1	...	0.08	0.33	...	...	...	1	336
1.11	3	2.56	0.40	0.42	0.26	0.14	1.07	3	337
20.60	6	...	...	...	...	...	...	...	338
3.08	2	...	...	...	...	...	...	...	339
4.22	1	...	...	...	...	...	...	...	340
4.84	1	..	0.43	0.98	...	...	...	1	341
4.94	1	3.42	0.33	0.93	0.27	0.22	0.72	1	342
2.77	5	8.38	1.94	0.56	0.50	0.16	2.15	5	343
51.57	4	...	...	...	...	...	...	...	344
0.96	4	...	...	...	...	...	...	...	345
36.11	1	...	0.36	1.42	...	...	...	1	346
1.26	1	...	...	...	...	...	...	1	347
4.39	1	...	(0.02)	(0.94)	...	...	...	...	348
3.30	1	...	0.07	0.91	...	...	...	1	349

Average percentage composition of Indian

S. No.	Name	Place of origin	Total ash	Ash sol. in HCl	Organic constituents		
					Crude protein	Carbohydrates	
						Fibre	Nitrogen-free extract
350	Oats	Punjab ...	4.79	1.83	10.07	12.71	65.8
351	Rice	Bangalore...	1.28	0.96	8.33	0.38	89.1
352	*Sarson* (*Brassica compestris*) ...	Lyallpur ...	6.02	...	21.58	6.25	22.5
353	*Senji pods*	Punjab ...	8.54	8.09	25.30	14.85	49.3
354	Soya been seed	Lyallpur ...	6.11	...	41.62	6.04	28.8
355	Wheat	Karnal ...	1.97	1.89	9.65	2.41	84.7
356	Ditto	Lyallpur ...	1.90	...	10.50	1.89	83.8
	Oilcakes and meals						
357	Cocoanut cakes (country mill pressed)...	Cochin ...	8.37	6.14	23.44	12.91	42.2
358	Ditto (expeller)	,, ...	8.34	6.48	25.34	13.20	44.9
359	Cotton seed cake	Punjab ...	6 50	...	22.84	24.11	37.4
360	Ditto meal	Bangalore...	7.96	6.94	37.22	7.63	34.3
361	Groundnut cake	,, ...	5.70	4.76	51.75	7.39	26.9
362	Linseed cake	Bengal ...	10.20	6.96	30.51	9.48	43.2
363	Ditto meal	Karnal ...	6.78	5 57	29.90	9.77	49.4
364	Maize cake	Rampur ...	3.45	...	23.67	9.88	48.0
364a	Maize cake	Lyallpur ...	2.52	...	19.55	7.73	41.1
365	*Mohua* cake	Karnal ...	9.03	5.11	17.90	5 62	50.2
366	Rape cake	Pusa ...	9.33	7.43	36.37	7.70	33.1
367	Safflower cake	Bombay ...	6.80	5.19	42.80	15.25	26.6
368	*Saron* cake	Punjab ...	9.99	...	36.00	10.05	32.7
369	*Til* cake	Bangalore	11.02	6.85	46.30	4.92	27.8
370	*Toria* cake	Lyallpur ...	7.54	...	33.79	11.20	34.0
	By-Products						
371	Arhar husk	Pusa ...	5.67	4.76	7.04	44.10	42.7
372	Brewery grain	Bangalore...	4.15	2.19	19.18	13.53	59.3
373	Gram dust	Pusa ...	5.55	4.61	17.48	27.01	47.4
374	Ditto husk	Bangolore	5.99	4.05	5.75	48.40	38.9
375	Groundnut shell	,, ...	14.25	10.20	8.16	59.74	14.8
376	Maize husk	Rampur ...	2.19	...	8.12	15.67	72.5
377	Molasses (*khandsari*)	Bangalore	6.08	...	0.92	...	93.0
378	Rice bran	Hosur, Madras ...	22.08	6.92	10.20	14.69	39.8
379	Ditto	Bengal ...	15.85	11.29	13.99	14.13	35 6
380	Wheat bran	Bangalore...	5.59	4.64	15.41	10.76	64.7
381	Ditto	Pusa ...	9.90	7.32	11.39	16.62	60.3

DIX I

feeding stuffs on dry matter basis

Ether extract	No. of analyses	Mineral constituents: Ash sol; in HCl	CaO	P_2O_5	MgO	Na_2O	K_2O	No. of analyses	Serial No.
6.55	5	...	(0.16)*	(0.93)*	...	...	...	...	350
0.88	4	...	0.22	0.48	0.18	...	0.32	1	351
43.65	1	...	0.69	1.62	...	...	...	1	352
1.94	1	8.09	1.87	0.80	0.41	...	2.78	1	353
17.41	1	...	0.57	1.77	...	...	...	1	354
1.27	1	1.89	0.32	0.94	0.11	0.03	0.47	1	355
1.85	1	...	0.20	0.77	...	...	...	1	356
13.00	1	...	...	...	...	...	...	...	357
8.20	1	...	(0.56)*	(1.69)*	...	...	...	...	358
9.15	1	...	...	...	...	...	...	...	359
12.88	8	...	(0.39)*	(2.96)*	...	...	...	...	360
8.22	81	...	0.28	1.28	0.54	0.32	1.43	46	361
6.57	2	6.96	0.52	2.20	0.98	0.47	0.92	2	362
4.12	4	...	...	...	...	...	...	...	363
14.97	1	...	0.32	1.19	...	...	...	1	364
19.80	...	...	...	...	...	...	...	...	364a
17.23	2	...	...	...	...	...	...	...	365
13.41	16	...	...	...	...	...	...	...	366
8.53	11	...	...	...	...	...	...	...	367
11.11	1	...	...	...	...	...	...	...	368
9.91	3	...	...	...	...	...	...	—	369
12.49	1	...	...	...	...	...	...	...	370
0.40	1	...	...	...	...	...	...	...	371
3.82	11	...	...	...	...	...	...	...	372
2.51	1	...	...	...	...	...	...	...	373
0.91	8	...	...	...	...	...	...	...	374
3.02	...	...	...	...	...	...	...	...	375
1.52	1	...	0.43	0.21	...	...	...	1	376
...	...	...	...	...	...	...	...	...	377
12.98	6	...	...	...	...	...	...	...	378
20.39	2	11.29	0.22	6.23	2.60	0.38	0.19	2	379
3.45	26	...	0.25	1.98	0.75	0.35	1.46	6	380
1.73	1	...	...	...	...	...	...	...	381

(*Foreign Data)

APPENDIX II

Average digestibility coefficients of Indian feeding stuffs

Serial No.	Name of feed	Place of origin	organic matter	Crude protein	Ether extract	Fibre	Nitrogen free extract	Total carbohydrates	No. of tests
	Green feeds								
1	Arali grass	Assam	...	40	23	63	54	57	...
1a	*Bajra*	Lyallpur	—	62	67	60	69	...	3
2	*Ber* leaves	Izatnagar	...	36	62	27	34	...	1
3	Berseem	Lyallpur	...	81	50	60	80	...	3
4	*Dal* grass	Assam	...	62	38	61	67	65	1
5	*Dal* grass hay ...	,,	...	42	39	71	61	64	1
5a	Dhus grass, young ...	Assam	...	52	33	63	65	64	...
6	Elephant grass ...	Lyallpur	...	62	59	63	65	...	3
7	*Guar*	,,	...	77	39	26	70	...	...
8	Guinea grass (young) ...	Bangalore	77	74	47	78	75	77	3
9	Guinea grass ...	,,	59	58	43	61	52	59	3
10	Ditto	Lyallpur	...	59	42	58	60	...	3
11	Jowar (young) ...	Bangalore	62	47	42	66	60	63	3
11a	Joy Joha grass ...	Assam	...	62	71	63	59	60	4
12	Ditto (prime) ...	Bangalore	58	44	44	59	60	60	9
13	Ditto (ripe) ...	,,	58	25	38	62	58	59	6
14	Ditto	Punjab	...	34	37	58	62	...	11
14a	Kharika grass ...	Assam	...	44	51	52	57	54	4
15	Lucerne	Bangalore	67	80	46	50	72	62	3
16	Maize	Lyallpur	...	61	65	70	76	...	4
16a	Nal grass, young ...	Assam	...	74	56	69	67	68	...
17	Oats	Lyallpur	...	72	50	76	79	...	4
18	*Paker* leaves ...	Izatnagar	...	56	62	32	58	...	1
18a	Para grass ...	Bangalore	65	68	63	66	63	64	6
19	*Pipal* leaves ...	Izatnagar	...	59	36	22	52	...	1
20	Senji ...	Lyallpur	...	82	43	58	76	...	3
21	Sudan grass ...	,,	...	28	32	58	51	...	3
22	Sunflower ...	,,	...	72	44	20	79	...	2
22a	Ulu grass ...	Assam	...	30	30	74	57	65	...
23	Velvet beans ...	Lyallpore	...	70	64	59	79	...	4
	Silage								
24	Jowar ...	Bangalore	56	40	47	63	53	57	4
25	Maize ...	Lyallpur	...	43	53	69	72	...	4
26	Oats ...	,,	...	52	48	77	61	...	8
27	Ragi straw ...	Bangalore	57	8	44	69	52	60	2
28	Spear grass ...	Hosur, Madras	59	26	40	69	...	62	12
29	Wheat straw ...	Bangalore	57	25	24	65	52	58	2
	Hays								
30	Ahmadnagar hay ...	Ahmadnagar	51	31	46	...	...	51	2
31	Ajjampur hay (young)	Mysore	67	49	29	79	61	70	2
32	Ditto (prime) ...	,,	64	36	45	75	58	66	2
23	Ditto (ripe) ...	,,	64	4	40	72	61	66	2
34	Ambala hay ...	Ambala	...	44	38	57	50	...	2

APPENDIX II—Contd.

Average digestibility coefficients of Indian feeding stuffs

Serial No.	Name of feed	Place of origin	Organic matter	Crude protein	Ether-extract	Fibre	Nitrogen free extract	Total carbohydrates	No. of tests
	Hays—contd.								
35	*Anjan* hay ...	Meerut	57	35	30	...	...	59	2
35a	Arali ...	Assam	...	38	31	66	50	55	...
36	Aurangabad hay ...	Aurangabad	52	13	45	57	50	53	6
37	Ditto (young) ...	,,	51	34	45	60	45	52	2
38	Ditto (prime) ...	,,	50	12	42	57	46	51	2
39	Ditto (ripe) ...	,,	47	...	57	53	43	48	2
40	Bangalore hay ...	Military Grass Farm Bangalore	54	2	39	63	50	55	9
41	Bellary hay ...	Bellary	54	11	43	60	52	56	6
42	Boda hay ...	Cuddapah	44	14	34	51	41	45	2
43	Bolarum hay ...	Bolarum	52		47	59	48	53	34
44	Ditto (young) ...	,,	59	45	...	...	...	61	3
45	Ditto (prime) ...	,,	59	32	...	...	...	61	3
46	Ditto (ripe) ...	,,	52	...	3	...	...	54	3
47	Dalhousie hay ...	Dalhousie	...	11	30	64	49	...	3
48	*Dub* hay ...	Bangalore	63	73	51	63	54	61	3
49	Ditto ...	Lyallpur	...	54	27	54	46	...	3
50	Ferozepur hay ...	Ferozepur	...	58	37	58	50	...	3
51	Guinea grass hay (before flower)	Bangalore	56	54	33	64	49	56	3
52	Ditto (in flower)	,,	53	44	28	60	47	54	3
53	Jhelum hay ...	Jhelum	...	34	35	64	61		3
54	Jowar hay (young) ...	Bangalore	57	41	31	67	50	58	6
55	Ditto (prime) ...	,,	56	41	28	60	44	57	12
56	Ditto (ripe) ...	,,	56	14	40	58	57	58	14
56a	Joy Joha ...	Assam	...	42	55	66	49	56	3
57	Jubbulpore hay (young)	Jubbulpore	58	23	29	64	57	60	3
58	Ditto (prime)	,,	57	12	39	63	56	59	3
59	Ditto (ripe) ...	,,	52	...	31	59	51	54	3
60	Jullundur hay ...	Jullundur	...	25	34	65	44	...	2
61	Jutogh hay ...	Jutogh	..	17	27	58	49	...	4
62	Kasauli hay ...	Kasauli	...	19	40	60	46		3
63	*Kollukatti* grass hay young	Hosur, Madras	68	66	28	...	...	69	3
64	Ditto (prime)	,,	63	55	41	...	...	64	3
65	Ditto (ripe)	,	59	47	23	...	...	60	3
66	Lahore hay ...	Lahore	...	36	26	64	52	...	2
67	Meerut Farm hay –	Meerut	48	8	34	...	...	49	18
68	Ditto ...	,,	55	28	25	54	57	56	3
69	Ditto (prime)	,,	52	14	31	54	55	54	3
70	Ditto (ripe)	,,	51	10	30	51	54	52	3
71	Multan hay (Geneva)	Multan	...	...	21	60	48	...	3
72	Multan hay (Musel)	,,	...	12	17	62	50	...	3
73	Murree hay ...	Murree	...	16	37	61	45	...	2
73a	Nal	Assam	...	43	27	48	38	42	...
74	Natal grass hay ...	Mysore	57	43	29	63	54	59	2

APPENDIX II—*contd.*

Avreage digestibility coefficients of Indian feeding stuffs

Serial No.	Name of feed	Place of origin	Organic matter	Crude protein	Ether extracct	Fibre	Nitrogen free extract	Total carbhydrates	No. of tests
	Hays—contd.								
75	Oat hay	Lahore	69	46	72	...	...	70	2
76	Ditto	Lyallpur	...	47	74	65	64	...	10
77	Rawalpindi hay ...	Rawalpindi	...	21	48	65	40	...	2
78	Rhodes grass hay ...	Bangalore	63	60	33	69	54	63	3
79	Ditto (young) ...	Hosur, Madras	64	50	33	...	...	66	2
80	Ditto (prime) ...	,,	65	55	39	...	...	67	2
81	Ditto (prime) ...	,,	59	49	38	...	...	59	2
82	*Rukh* hay (ripe) ...	Bolarum	53	14	48	...	...	55	4
83	Scented grass hay ...	Cuddappah	56	47	33	64	53	58	3
84	Seguri hay	Seguri	48	52	49	...	...	48	3
85	Sialkot hay	Sialkot	...	40	29	55	50	...	2
86	Spear grass hay (young)...	Hosur, Madras	58	42	42	63	50	59	18
87	Ditto (prime) ...	,,	50	16	43	57	47	51	18
88	Ditto (ripe) ...	,,	55	...	36	...	...	57	18
89	Star grass hay ...	Almora	...	44	57	...	...	52	2
90	Sugarcane leaves ...	Bangalore	49	...	26	56	47	51	3
91	Telegaon hay ...	Telegon	39	2	40	..	...	40	4
92	Tornagallu hay ...	Tornagollu	52	2	43	57	50	53	6
93	*Uridal* grass hay ...	Assam	...	50	22	74	55	63	1
94	*Usar* grass hay ...	Etawah	...	42	41	...	...	43	1
94a	Venezuela preflowering...	Izatnagar	56	37	11	64	62	62	6
94b	—do— flowering ...	Izatnagar	57	31	14	62	58	60	...
	Legume hays								
95	Berseem hay... ...	Lyallpur	...	70	29	49	77	...	4
96	Cowpea hay	Mysore	62	68	...	51	62	57	4
97	Groundunt hay ...	,,	61	69	...	39	64	54	5
98	Lucerne hay... ...	Banaglore	63	77	30	51	68	60	6
	Straws								
99	Gram *bhoosa* or straw ...	Lyallpur	...	40	...	40	47	...	3
100	*Ragi* straw	Bangalore	60	6	41	69	58	62	40
101	Rice straw	,,	60	...	35	72	53	62	24
102	Ditto (Bengal) ...	Dacca	51	9	43	62	46	...	(graphic method
103	Ditto	Kangra, Punjab	49	...	47	61	42	51	3
104	Ditto	Pusa	58	...	56	72	43	61	18
105	Wheat straw ...	Lyallpur	...	...	36	61	53	...	3

APPENDIX II—Contd.

Average digestibility coefficients of Indian feeding stuffs

Serial No.	Name of feed	Place of origin	Organic matter	Crude protein	Ether-extract	Fibre	Nitrogen free extract	Total carbohydrates	No. of tests
	Concentrates: Grains and seeds								
106	*Arhar* (*Cajanus indicus*)	Lyallpur	...	70	50	...	...	82	1
107	*Bajra*	„	...	47	55	...	...	61	1
108	Barley	„	...	72	91	...	...	76	1
109	Cotton seed	„	...	69	90	63	59	...	18
110	Gram	„	...	69	84	...	...	89	1
111	*Guara*	„	...	82	63	...	...	81	1
112	*Jowar*	„	...	48	65	...	...	89	1
113	Linseed	„	...	81	93	...	...	67	1
114	Maize	„	...	55	82	...	...	76	1
115	*Matri* (*Lens esculenta*) ...	„	...	79	79	...	...	85	1
116	*Math* (*Phaseoleus aconitifolius*)	„	...	78	75	...	...	87	1
117	*Rawan* (*Dolichos lablab*)	„	...	77	60	...	...	72	1
118	*Sarson*	„	...	95	69	...	...	81	1
119	Soya bean	„	...	90	77	...	...	58	1
120	Wheat	„	...	60	67	...	...	97	1
	Concentrates: Cakes and meals								
121	Cotton seed cake ...	„	...	85	98	74	59	...	...
122	Groundnut cake ...	Bangalore	75	90	97	10	51	...	24
123	Linseed cake... ...	Bengal	72	85	96	27	67	...	18
124	Maize cake	Rampur	...	84	70	...	...	60	1
124a	Maize cake, Trial 1 ...	Lyallpur	...	64	87	...	...	55	...
124b	-do- Trial 2 ...	Lyallpur	...	70	98	...	...	52	...
125	*Sarson* cake	Lyallpur	...	85	93	44	74	...	...
126	*Toria* cake	„	...	84	91	38	61	...	...
	By-products								
127	Gram husk	Bangalore	...	...	85	66	71	70	7
128	Maize hnsk	Rampur	...	55	53	76	79	79	1
129	Wheat bran	Bangalore	76	77	66	20	84	77	10

APPENDIX III—*contd.*

Nutritive values of Indian feeding stuffs

S. No.	Name	Place of origin	Digestible nutrients per 100 lb. dry material				Nutritive ratio	Digestible nutrients per 100 lb. raw material**		
			Crude protein	Carbohydrates	Ether extract	Total		Digestible crude protein	Starch equivalent	Total digestible nutrients
	Green feeds		lb.	lb.	lb.	lb.				
1	Arali grass	Assam	...	...	...	...	...	0.82	11.9	...
1a	*Bajra*	Lyallpur	4.31	52.63	1.02	59.24	12.9	1.03	11.6	14.8
2	Berseem	Bihar	12.51	44.47	1.18	59.18	3.8	2.51	10.0	11.9
3	Ditto	Punjab	14.10	48.23	0.94	14.41	3.1	2.82	11.0	12.9
4	*Dal* grass	Assam	5.81	49.48	0.87	57.24	...	1.41	12.5	14.3
4a	Dhus grass	,, ...	...	...	...	...	...	1.04	10.5	...
5	Elephant grass	Punjab	3.85	48.54	1.33	55.39	13.4	0.91	11.1	13.8
6	*Guar*	,, ...	1.13	40.73	0.67	48.83	6.4	1.33	7.6	9.8
7	Guinea grass (young) ...	Bangalore ...	5.83	58.00	0.56	65.09	10.2	1.41	12.3	16.3
8	Ditto	,, ...	4.44	45.23	0.72	11.28	10.1	1.11	8.6	12.8
9	Ditto	Bengal	4.10	44.93	0.74	11.20	10.1	1.15	9.5	12.8
10	Ditto	Lyallpur	3.10	47.72	0.65	12.28	15.9	0.78	9.0	13.1
11	*Jowar* (young)	Bangalore ...	4.20	50.07	0.91	16.27	12.4	0.84	8.6	11.3
12	Ditto (prime)	,, ...	3.44	48.86	0.77	14.03	14.7	1.03	12.0	16.2
13	Ditto (ripe)	,, ...	1.11	11.24	0.45	13.40	45 0	0.41	13.3	21.4
14	Ditto (9 to 10 1/2 weeks) ...	Bihar	1.21	12.68	0.52	11.12	42.1	0.25	8.7	11.0
15	Ditto (18 weeks) ...	,, ...	0.88	13.16	0.56	11.29	62.1	0.21	12.4	16.6
16	Ditto (young)	Punjab	2.46	13.16	0.58	16.93	22.2	0.49	8.3	11.3
17	Ditto (prime)	,, ...	1.67	12.73	0.62	15.80	32.5	0.50	12.0	16.7
18	Ditto (ripe)	,, ...	0.97	12.02	0.60	14.34	54.9	0.39	14.5	21.7
18a	Joy Joha grass, flowering ...	Assam	...	...	...	...	...	1.25	10.9	...
19	Lucerne	Bangalore ...	16.19	41.59	1.06	60.17	2.7	3.24	9.7	12.0
20	Ditto	Bihar	18.17	37.34	1.31	58.47	2.2	3.13	10.1	11.7
21	Ditto	Punjab	15.92	40.00	0.83	57.79	2.6	3.18	9.3	11.6
22	Maize	Lyallpur	4.18	60.94	0.96	67.77	13.5	1.17	14.5	16.9
23	Ditto	Bihar	4.14	61.08	1.36	68.28	15.5	1.04	13.4	17.1

24	Oats	Punjab	10.50	53.79	1.07	66.70	5.4	2.63	13.1	16.7	
24a	Para grass	Bangalore ...	7.91	...	...	59.54	...	1.51	...	11.4	
25	*Senji*	Punjab	12.61	50.01	0.63	64.04	4.1	2.52	10.3	12.8	
26	Sudan grass	,, ...	1.57	41.47	0.61	44.41	27.2	0.39	8.7	11.1	
27	Sunflower	,, ...	8.55	40.56	1.51	52.50	5.1	2.14	10.8	13.1	
27a	Ulu grass	Assam	...	...	...	...	...	1.40	15.4	...	
28	Velvet beans	Punjab	10.66	49.64	1.37	63.38	4.9	2.13	11.3	12.7	
	Tree Leaves										
29	*Ber*	Izatnagr	3.09	25.13	1.08	30.65	9.0	1.24	6.3	12.3	
30	*Paker*	,, ...	5.38	37.01	2.10	47.12	7.7	2.15	13.0	18.8	
31	*Pipal*	,, ...	7.00	28.59	1.19	38.26	4.5	2.10	7.9	11.5	
	Silage										
32	*Jowar*	Bangalore ...	2.35	46.93	0.82	51.13	20.8	0.71	9.9	15.3	
33	Maize	Punjab	3.41	56.70	0.59	61.13	17.0	1.02	15.5	18.4	
34	Oats	,, ...	4.06	55.67	1.09	62.18	14.3	1.22	11.9	18.7	
35	*Ragi* straw	Bangalore ...	0.30	51.04	0.64	52.78	175.0	0.09	10.2	15.8	
36	Spear gross	Hosur, Madras ...	1.74	47.00	0.66	50.22	27.8	0.52	12.0	15.1	
37	Wheat straw	Bangalore ...	0.86	47.37	0.11	48.48	55.5	0.26	8.7	14.5	
	Hays										
38	Ahmadnagar hay	Ahmadnagar ...	1.20	39.83	0.45	42.05	34.1	1.08	18.4	37.8	
39	Ajjampur hay (young) ...	Mysore ...	3.85	54.88	0.30	19.41	14.1	3.47	33.9	53.5	
40	Ditto (prime) ...	,, ...	1.96	54.11	0.43	17.03	28.0	1.76	30.6	51.3	
41	Ditto (ripe) ...	,, ...	0.13	57.72	0.29	18.51	466.3	0.12	33.1	52.7	
42	Ambala hay	Ambala ...	2.45	43.11	0.54	47.22	18.3	2.21	23.5	42.5	
43	*Anjan* hay	Meerut ...	1.71	49.41	0.25	11.68	29.3	1.54	29.2	46.5	
44	Ditto	Punjab ...	2.01	47.54	0.43	10.51	24.2	1.81	26.1	45.5	
44a	Aralı	Assam	...	...	...	...	...	2.00	23.9	...	
45	Aurangabad hay	Aurangabad ...	0.31	42.57	0.70	44.41	141.0	0 28	20.9	40.0	
46	Ditto (young) ...	,, ...	1.43	41.80	0.52	44.40	30.0	1.29	20.9	40.0	
47	Ditto (prime) ...	,, ...	0.30	42.22	0.61	43.89	146.5	0.27	19.6	39.2	
48	Ditto (ripe)	,, ...	0.00	39.02	0.75	40.70	...	0.00	16.2	36.6	
49	Bangalore hay	Military Grass Farm, Bangalore ...	0.05	47.55	0.49	48.71	1048.0	0.00	25.2	43.8	
50	Bellary hay	Bellary. Madras ...	0.27	43.49	0.16	41.01	162 8	0.24	21.1	30.5	
51	*Boda* hay	Cuddappah ...	0.52	39.89	0.46	41.44	79.1	0 47	15.9	37.3	
52	Bolarum hay	Bolarum ...	0.00	43.72	0.68	45.25	...	0.00	21.2	40.7	

APPENDIX II—(*Contd*)

Nutritive values of Indian feeding stuffs

S. No.	Name	Place of origin	Digestible nutrients per 100 lb. raw material				Nutritive ratio	Digestible nutrients per 100 lb. raw material**		
			Crude protein	Carbohydrates	Ether extract	Total		Digestibel crude protein	Starch equivalent	Total digestible nutrients
			lb.	lb.	lb.					
53	Bolarum hay (young) ...	Bolarum ...	2.27	49.05	0.32	52.04	22.0	2.04	27.8	46.8
54	Ditto (prime) ...	,, ...	1.21	50.03	0.43	52.21	42.2	1.09	27.5	47.0
55	Ditto (ripe)	,, ...	0.00	49.96	0.28	47.59	...	0.00	22.8	42.8
56	*Dal* grass hay	Assam ...	0.15	50.03	0.56	54.44	...	2.65	31.2	46.7
57	Dalhousie hay	Dalhousie ...	0.38	47.90	0.27	48.88	126,8	0.34	23.8	45.0
58	*Dub* hay	Bangalore ...	8.09	44.21	0.98	54.52	5.7	7.28	34.8	49.1
59	Ditto	Bareilly ...	4.94	38.41	0.26	43.94	7.9	4.45	26.5	39.5
60	Ditto	Fyzabad ...	4.18	37.40	0.91	43.62	9.4	3.76	26.6	39.3
61	Ditto ... ... —	Lucknow ...	4.09	39.56	1.39	46.78	10.5	3.68	30.6	42.1
62	Ditto ... — ...	Karnal ...	3.68	38.98	0.17	43.04	10.7	3.31	25.9	38.7
63	Ditto	Lyallpur ...	6.04	36.16	0.38	43.05	6.1	5.44	28.7	38.7
64	Ferozepur hay	Ferozepur ...	5.23	41.95	0.38	48.04	8.2	4.71	25.7	43.2
65	Guinea grass hay (before flower)	Bangalore ...	4.09	42.33	0.40	47.33	10.6	3.68	22.3	42.6
66	Ditto (in flower) ...	,, ...	2.09	43.89	0.32	46.69	21.3	1.88	19.9	42.0
67	Jhelum hay	Jhelum ...	1.76	52.14	0.42	54.85	30.1	1.58	33.5	49.4
68	*Jowar* hay (young)	Bangalore ...	2.81	47.65	0.42	51.39	17.3	2.53	24.8	46.3
69	Ditto (young)... ...	,, ...	1.78	48.66	0.32	51.17	27.7	1.60	25.6	46.1
70	Ditto (pirme)	,, ...	0.64	49.99	0.43	51.59	79.8	0.58	24.3	46.4
71	Ditto (ripe)	Punjab ...	2.25	46.79	0.46	50.07	21.3	2.03	25.1	45.1
71a	Joy Johi	Assam ...	...	...	...	...	...	2.40	2.67	...
72	Jubbulpore hay (young) ...	Jubbulpore ...	0.49	50.26	0.42	52.13	54.2	0.85	26.6	46.9
73	Ditto (prime) ...	,, ...	0.40	51.41	0.44	52.79	130.6	0.36	26.8	47.5
74	Ditto (ripe) ...	,, ...	0.00	45.94	0.31	46.65	...	0.00	21.2	42.0
75	Jullundur hay	Jullundur ...	0.88	46.54	0.33	48.17	53.9	0.79	22.2	43.4
76	Jutogh hay	Jutogh	0.64	46.31	0 38	47.81	71.5	0.58	22.3	43.0
77	Kasauli hay	Kasauli ...	0.81	44.06	0.70	46.44	56.5	0.73	22.3	41.8

78	*Kolukkattai* grass hay (young)...	Hosur Madras ...	11.17	47.56	0.32	59.44	4.3	10.05	37.9	53.5
79	Ditto (prime)...	,, ...	5.49	49.56	0.48	56.13	9.2	4.94	31.7	50.5
80	Ditto (rpie) ...	,, ...	2.97	49.46	0.16	52.78	16.8	2.67	29.9	47.5
81	Lahore hay	Lahore ...	1.60	48.36	0.37	50.78	30.8	1.44	25.3	45.7
82	Meerut Farm hay	Meerut ...	0.25	41.94	0.31	42.89	172.4	0.23	18.4	38.6
83	Ditto (young) ...	,, ...	0.99	44.99	0.40	46.88	46.3	0.89	25.0	42.2
84	Ditto (prime) ...	,, ...	0.39	44.12	0.48	45 59	114.7	0.35	24.2	41.0
85	Ditto (ripe) ...	,, ...	0.27	43.76	0.31	44.73	163.1	0.24	20.7	50.3
86	Multan hay (Geneva) ...	Multan... ...	0.00	45.28	0.26	45.87	...	0.00	20.7	41.3
87	Multan hay (Musel) ...	Multan ...	0.38	46.53	0.16	47.27	123.9	0.34	23.5	42.5
88	Murree hay	Murree ...	0.57	46.13	0.70	48.28	81.9	0.51	20.3	43.5
89	Natal grass hay	Mysore ...	2.42	49.79	0.41	53.12	21.0	2.18	25.8	47.8
90	Oat hay	Lahore ...	2.40	60.02	0.74	64.09	25.7	2.16	42.2	57.7
91	Ditto	Lyallpur ...	2.62	54.61	1.26	60.06	22.0	2.36	34.7	54.1
92	Rawalpindi hay	Rawalpindi ...	0.86	44.07	0.77	46.66	53 4	0 77	21.7	42.0
93	Rhodes grass hay	Bangalore ...	7.38	49.95	0.80	55.13	6.5	6.64	34.7	49.6
94	Ditto (young) ...	Hosur, Madras ...	3.72	53.17	0.39	57.78	14.5	3.35	32.6	52.0
95	Ditto (prime) ...	,, ...	5.13	52.20	0.49	58.43	10.4	4.62	33.3	52.6
96	Ditto (ripe) ...	,, ...	3.11	48.91	0.45	53.02	16.1	2.80	26.9	47.7
97	*Rukh* hay	Bolarum ...	0.34	48.23	0.60	49.92	147.9	0.31	23.2	44.9
98	Ditto ... (ripe) ...	,, ...	0.39	45.41	0.46	46.83	118.3	0.35	25.7	42.2
99	Ditto	Jubbulpore ...	0.33	47.39	0.43	48.70	144.9	0.30	28.6	43.8
100	Ditto	Kirkee, Poona ...	0.36	43.35	0.42	44.65	122.2	0.32	22.2	40.2
101	Scented grass hay	Cuddappah ...	3.03	47.99	1.07	53.43	16.6	2.73	28.9	48.1
102	*Seguri* hay	Seguri ...	3.02	39.69	0.49	43.74	13.5	2.72	19.0	39.4
103	Sialkot hay	Sialkot ...	1.94	43.94	0.28	46.52	23.0	1.75	21.5	41.9
104	Spear grass hay (in flower) ...	Bangalore ...	0.89	43.00	0.61	45.27	50.0	0.80	20.5	40.7
105	Ditto (in Seed) ...	,, ...	0.00	49.09	0.53	50.29	...	0.00	25.6	45.3
106	Ditto (young) ...	Hosur Madras ...	2.93	48.76	0.57	52.97	17.1	2.64	29.3	47.7
107	Ditto (prime) ...	,, ...	0.84	42.78	0.51	44.77	52.4	0.76	20.9	40.3
108	Ditto (ripe) ...	,, ...	0.00	49.93	0.35	50.71	...	0.00	25.6	45.6
109	Ditto (early) ...	Bombay ...	2.47	47.12	0.47	50.65	19.5	2.22	27.8	45.6
110	Ditto (before flower)	,, ...	1.86	49.38	0.42	52.19	27.1	1.67	26.6	47.0
111	Ditto (in flower) ...	,, ...	0.59	44.17	0.41	45.67	76.9	0.53	20.0	41.1
112	Ditto (in seed) ...	,, ...	0.00	49.61	0.33	50.34	...	0.00	25.3	45.3
113	Ditto	United Provinces...	0.00	49.78	0.29	50.43	...	0.00	27.7	45.4
114	Ditto	Murree Hills ...	2.25	51.13	0.67	54.89	23.4	2.03	29.9	49.4
115	Sugarcane leaves	Bangalore ...	0.00	45.50	0.36	46.30	...	0.00	22.1	41.7
116	Telegaon hay	Telegaon ...	0.05	32.60	0.39	33.53	647.8	0.05	10.5	30.2
117	Tornagallu hay	Tornagallu ...	0.05	45.38	0.52	46.60	1028.0	0.05	22.2	41.9
118	Star grass hay	Almora ...	2.39	43.08	0.51	46.62	18.0	1.95	21.9	42.0

APPENDIX III—(*contd.*)

Nutritive values of Indian feeding stuffs

S. No.	Name	Place of origin	Digestible nutrients per 100 lb. dry material				Nutritive ratio	Digestible nutrients per 100 lb. raw material**		
			Crude protein	Carbohydrates	Ether extract	Total		Digestible crude protein	Starch equivalent	Total digestible nutrients
			lb.	lb.	lb.	lb.				
119	*Uridal* grass hay	Assam ...	4.09	46.81	0.39	51.78	...	3.49	28.1	44.0
120	*Usar* grass hay	Etawah ...	2.57	36.13	0.42	39.65	14.4	2.31	17.5	35.7
120a	Venezuela, pre flowering ...	Izatnagar ...	1.61	...	...	55.79	33.7	1.45	30.3	50.2
120b	Ditto flowering ...	„ ...	1.29	...	...	52.11	39.4	1.16	27.9	46.9
	Legume hays									
121	Berseem hay	Lyallpur ...	10.29	54.44	0.47	65.79	5.4	9.26	42.6	59.2
122	Cowpea hay	Mysore ...	10.33	40.13	0.00	50.46	3.9	9.30	26.6	45.3
123	Groundnut hay	„ ...	14.93	34.00	0.00	48.90	2.3	13.44	30.4	44.0
124	Lucerne hay	Bangalore ...	16.37	38.59	0.42	55.90	2,4	14.73	33.9	50.4
124a	Bhurra	Izatnagar ...	...	...	...	27.8	...	...	35.2	...
125	Gram *bhoosa* or straw ...	Lyllapur ...	2.41	34.67	0.00	37.08	14.4	2.17	10.1	33.4
126	*Ragi* straw ...	Bangalore ...	0.23	54.55	0.38	55.63	243.5	0.21	31.2	50.1
127	Rice straw ...	„ ...	0.00	48.86	0.30	49.54	...	0.00	27.1	44.6
128	Ditto (*Aman*) ...	Bengal ...	0.28	42.85	0.44	44.13	154.4	0.25	22.1	39.7
129	Ditto (*Aus*) ...	„ ...	0.44	42.60	0.68	44.57	100.2	0.40	21.7	40.1
130	Ditto (*Boro*) ...	„ ...	0.50	37.18	0.41	38.59	76.6	0.45	19.4	34.7
131	Ditto	Kanke Farm, Bihar	0.00	49.04	0.53	50.23	...	0.00	29.0	45.2
132	Ditto	Pusa, Bihar ...	0.00	48.33	0.48	49.41	...	0.00	26.9	44.5
133	Ditto	Kangra, Punjab ...	0.00	40.71	0.41	41.62	...	0.00	18.3	37.5
134	Ditto	Karnal Punjab ...	0.00	37.11	0.72	38.74	...	0.00	18.6	34.9
135	Wheat straw	Pusa, Bihar ...	0.00	47.65	0.58	48.95	...	0.00	21.0	44.1
136	Ditto	Karnal Punjab ...	0.00	47.31	0.41	48.24	...	0.00	23.2	43.4
137	Wheat Bhoosa	„ ...	0.00	46.75	0.36	47.56	...	0.00	22.1	42.8

	Concentrates: Grains and seeds									
138	*Arhar*	Lyallpur	...	14.35	57.56	0.95	74.05	4.2	12.92	64.4	75.6
139	*Bajra*	,,	...	5.08	49.17	2.81	60.57	11.1	4.57	51.3	54.5
140	Barley*	Bangalore	...	7.39	75.69	1.30	86.01	10.6	6.65	75.5	77.4
141	Ditto	Mona, Punjab	...	8.97	77.55	0.83	86.38	8.6	8.07	73.6	77.7
142	Ditto	Lyallpur	...	7.29	63.90	2.65	77.15	9.6	6.56	68.0	69.4
143	Cotton seed	,,	...	12.49	34.65	18.50	88.77	6.1	11.24	68.4	80.0
144	Gram*	Bangalore	...	14.33	63.27	1.96	82.01	4.7	12.90	69.2	73.8
145	Ditto	Lyallpur	...	13.54	64.88	4.07	87.17	5.5	12.19	76.1	78.5
146	Ditto*	Pusa	...	13.37	63.42	2.69	82.83	5.2	12.03	70.0	74.6
147	Ditto*	Punjab	...	11.96	64.80	3.14	83.83	6.0	10.76	70.8	74.5
148	*Guar*	Lyallpur	...	32.23	39.93	2.96	78.82	1.4	29.01	67.5	70.9
149	*Jowar*	,,	...	7.30	70.76	1.63	81.73	10.2	6.57	69.3	73.6
150	Linseed	,,	...	15.57	26.42	33.58	117.55	6.6	14.01	108.7	105.8
151	Maize*	Punjab		8.22	76.90	4.08	94.31	10.5	7.40	83.5	84.9
152	Ditto	Lyallpur	...	5.80	64.07	2.71	79.56	12.1	5.22	67.8	68.4
153	*Matri*	,,	...	19.59	59.33	0.63	80.34	3.1	17.63	69.8	72.3
154	*Moth*	,,	...	20.75	56.72	1.20	80.77	2.9	18.67	69.5	72.2
155	Oats	Punjab	...	7.86	57.81	5.70	78.48	9.0	7.07	64.0	70.6
156	*Rawan*	Lyallpur	...	20.33	46.66	0.54	68.24	2.3	18.30	59.0	61.4
157	*Sarson* seed	,,	...	20.50	23.29	30.12	111.56	4.5	18.45	102.8	100.4
158	Soya bean seed	,,	...	37.46	20.22	13.41	87.84	1.3	33.71	78.1	79.1
159	Wheat	,,	...	6.30	83.18	1.24	92.27	13.6	5.67	78.5	83.0
	Concentrates : Cakes and meals									
160	Cocoanut cake* (country mill pressed)	Cochin	...	21.10	39.75	13.00	90.10	3.3	18.99	76.3	81.1
161	Ditto (expeller) ...	,,	...	22.81	42.12	8.20	83.81	2.7	20.53	69.1	75.4
162	Cotton seed cake	Lyallpur	...	19.42	39.96	8.97	79.56	3.1	17.48	59.3	71.6
193	Cotton seed meal	Banglore	...	31.65	25.99	12.62	86.04	1.7	28.49	74.2	77.4
164	Groundnut cake	,,	...	46.39	14.59	7.97	78.92	0.7	41.75	67.4	71.0
165	Linseed	Bengal	...	25.86	31.69	6.33	71.79	1.8	23.57	60.6	64.6
166	Maize cake	Rampur	...	19.88	34.90	11.83	81.39	3.1	18.10	67.4	74.1
166a	Maize cake Trial 1 ...	Lyallpur	...	12.52	27.76	17.17	78.93	5.3	11.61	...	73.2
166b	Ditto Trial 2 ...	,,	...	13.53	27.94	19.54	85.48	5.3	12.55	...	79.3
167	Rape cake	Pusa	...	30.92	27.79	12.48	86.77	1.8	27.83	75.7	78.1
168	*Sarson* cake	Lyallpur	...	30.68	28.46	10.34	82.41	1.7	27.61	70.4	74.2
169	*Til* cake	Bangalore	...	42.60	23.36	9.32	86.92	1.0	38.34	75.9	78.2
170	*Toria* cake	Lyallpur	...	28.51	24.97	11.35	79.01	1.8	25.66	66.7	71.1

APPENDIX III—(*contd.*)

Nutritive values of Indian feeding stuffs

S. No.	Name	Place of origin	Digestible nutrients per 100 lb. dry material				Nutritive ratio	Digestible nutrients per 100 lb. raw material**		
			Crude protein	Carbohydrates	Ether extract	Total		Digestible crude protein	Starch equivalent	Total digestible nutrients
	By-products		lb.	lb.	lb.	lb.				
171	Gram husk	Bangalore ...	0.00	59.59	0.77	61.33	—	0.00	29.8	55.2
172	Maize husk	Rampur ...	4.54	68.94	0.81	75.30	15.6	4.09	59.1	67.2
174	Rice bran*	Hosur. Madras ...	6.76	35.15	10.00	64.40	8.5	6.08	52.0	58.9
174	Ditto*	Bengal ...	9.09	31.69	15.70	76.11	7.4	8.18	63.8	68.0
175	Wheat bran	Bangalore ...	11.80	58.00	2.28	74.93	5.4	10.62	62.3	67.5
176	Ditto — ...	Pusa, Bihar ...	8.72	59.10	1.14	70.39	7.1	7.85	54.5	63.4

*In these cases foreign digestibility coefficients have been used for calculation.

**In calculating these values, the dry matter content has been assumed as follows :—

		Per cent.
(*a*)	All air dry materials, such as dry roughage, cake grain, etc. ... —	90
(*b*)	Succulent silage.	30
(*c*)	Green pasture, green maize etc.	25
(*d*)	*Jowar* (prime)	30
	Ditto (ripe) —	40
(*e*)	Green legumes like berseem and lucerne	20

The nutritive values given in these columns are therefore approximate.